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- Turtle Beach Montego A3D64 Voice PCI Sound Card
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- 3.5" 1.44MB Diskette Drive
- ATI® 8MB 3D 2X AGP Integrated Graphics
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- 32X Variable EIDE CD-ROM Drive
- Harman Kardon HK195 Speakers
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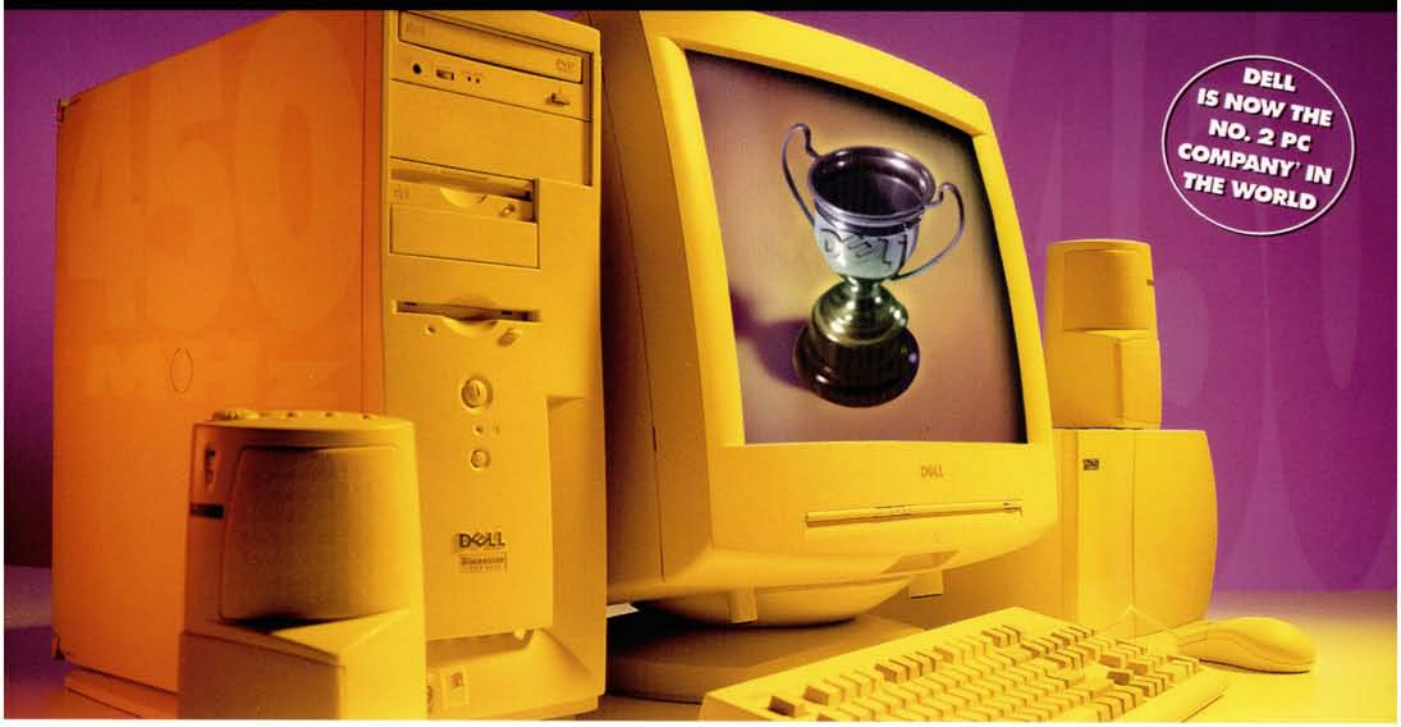

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- NEW Turtle Beach Montego II 320 Voice PCI Sound Card
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- 19" Colour Monitor (17.9" v.i.s.)
- Microsoft® IntelliMouse™
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- Turtle Beach Montego A3D64 Voice PCI Sound Card
- 40X Variable EIDE CD-ROM Drive
- Harman Kardon HK195 Speakers
- 17" Colour Monitor (15.9" v.i.s.)
- Microsoft® IntelliMouse™
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- McAfee Virus Scan
- 56K Capable U.S. Robotics X2 WinModem
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- High-fidelity Audio SoundBlaster Compatible
- 24X Variable CD-ROM Drive
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- 3.5" 1.44MB Diskette Drive
- 4MB ATI® RAGE LT PRO 2X AGP Video Controller
- High-fidelity Audio SoundBlaster Compatible
- 24X Variable CD-ROM Drive
- 14.1" XGA Colour TFT Display
- Microsoft® Windows® 98
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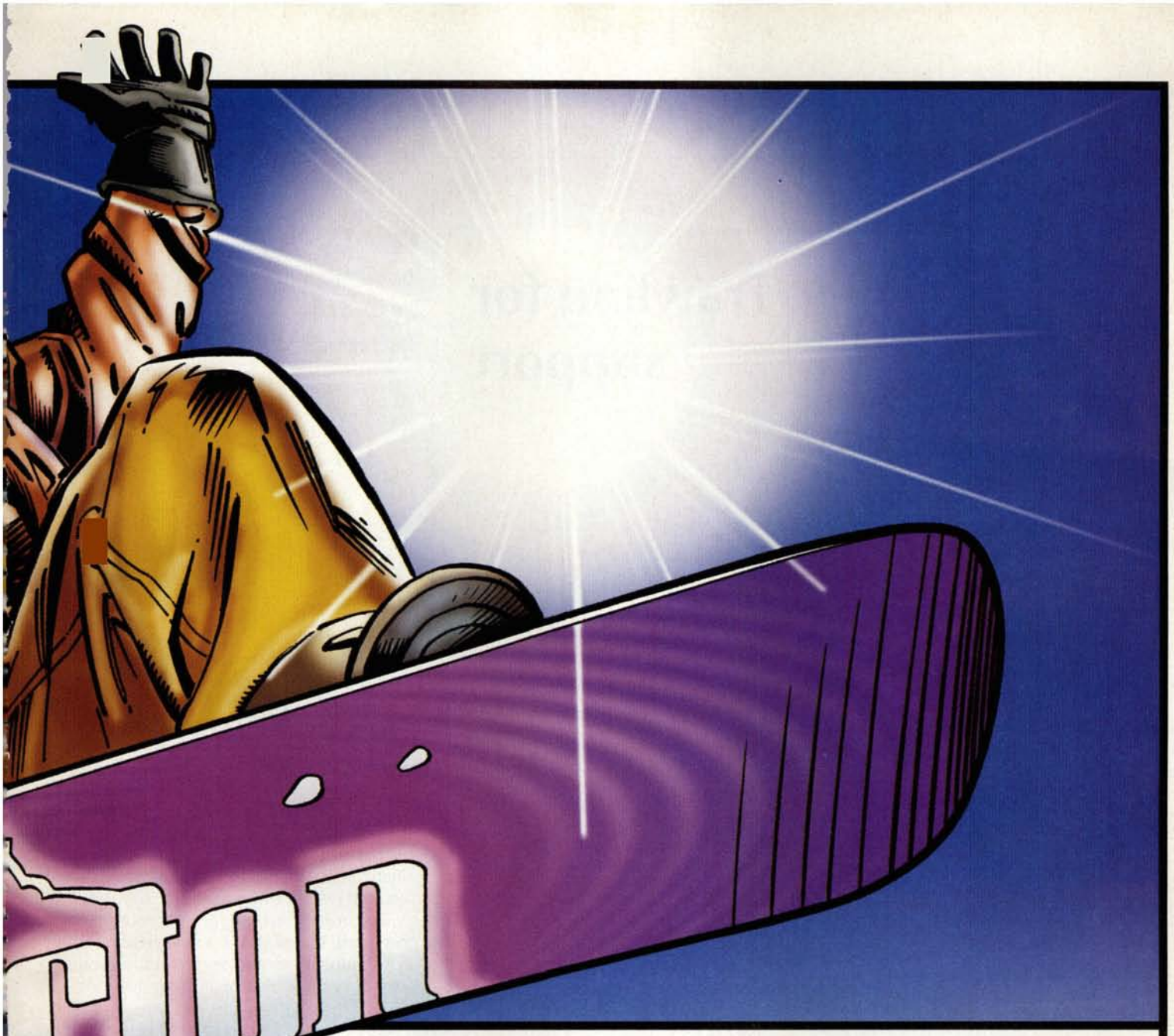

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Editorial

Trawling for support

Despite claims of easy-to-use technology, there's a long way to go before hardware upgrades are hassle-free.

By Jeremy White

Every now and then articles in *APC* touch a raw nerve with readers, and generate bucketloads of feedback. Two such articles in recent months have been Simon Vandore's article on upgrading his old Osborne, and Richard Walsh's article about the frustrations for a consumer of buying a home PC and getting it working, both in the Just DIY section. Angus Kidman's 'Why Software Sucks' has generated a huge amount of feedback over the past few years.

You don't hear people whinge about their cars the way they whinge about their PCs. Dishwashers don't generate the impassioned and vitriolic sentiments you find in some of our readers' letters. And I've never heard a toaster described with some of the epithets regularly attached to peripherals. It's almost as though folks love to hate their technology.

PC technology is an increasingly useful tool for humanity, and there are some wonderful pieces of consumer-oriented technology starting to appear. But the IT industry is having itself on if it thinks its products are easy enough to use to satisfy most consumers — and that applies to both hardware and software.

Even though I've been using computers since I was knee-high to a Wang Mini, and tend to spend most of my working hours glossing over technology's faults, every now and then fate serves me a reminder of just how annoying and frustrating using this stuff can be.

I spend much of my time using a Toshiba Portege 660CDT. It's a great little notebook. It's light, very compact, and has reasonable performance and features considering that it has aged slightly.

When the beta release of Windows 98 came out, the internal modem refused to work with it. All the diagnostics reported fine, it responded to AT commands, it just refused to give me a dial tone. I discovered this 2,000km from home, with no access to another modem. After sitting up all night trying to fix it I gave up, thinking "Not to worry, it will work with the Gold code", and reverted to my old trusty Banksia external 28K modem when I got home.

Of course, when I installed the Windows 98 Gold code, it was no help, and the internal modem remained decidedly antisocial. "Oh well," I thought, "time to upgrade to a 56K modem anyway." So I tried installing a Netcomm CardModem56 Combo. The Ethernet worked first time, but the modem part just wouldn't talk to Windows.

I hate to think how many hours I've wasted over the past few months trawling the Web sites of Toshiba, Netcomm, Microsoft and every other support and IT site I could think of, struggling in vain to find a fix. I've downloaded and applied each new driver release and BIOS update, manually changed around IRQs, and reinstalled Windows 98 from scratch. All with no result.

Last weekend really topped off the whole experience, though. I hadn't tried finding a fix for a few weeks, until I noticed there were new firmware upgrades for the Combo card on the Netcomm site. Fool I am, I tried installing them. Old firmware backed up successfully. Loader module uploaded to the card successfully. Then whammo, "Problem with Xmodem send". I couldn't apply the upgrade, couldn't revert to the backup, and no attempt at repeating the operation would work. The card, of course, was now scrambled, and I knew I'd have to send it into Netcomm. So it was back to my trusty old Banksia.

The kind of problems I am talking about are not vendor-specific, they are systemic. It just isn't supposed to be like that.

I've been searching for a moral to the story and, although it's a stretch, there is one. I think all technology journalists and writers should maintain and upgrade their own equipment. When you're showered with new product releases, it's easy to forget how frustrating trying to get technology to work can be, especially mixtures of different generations of technology. If I'd been happy to leave my notebook as it was preconfigured, all would have been well. But I'm a great believer in progress, and in making use of tools as they become available. It probably does me a lot of good to waste my weekends being reminded what the cost of that progress is, and how far the industry still has to go. And above all, how important it is that *APC* doesn't get too caught up in the wonder of new technology — as great as it might be — and continues to cast a critical eye over it.

You don't hear people whinge about their cars the way they whinge about their PCs.

You can reach Jeremy White at jwhite@acp.com.au.

Contents

November 1998, Volume 19 Number 11

NEWSWIRE 21

News Roundup 24
Windows faces new threats 21
From analog to digital 21
Australia lags online 24
IT research deemed shortsighted 24
MLPPP no clear path 26
Mounting costs of Y2K apathy 26

NEWS ANALYSIS
Can DHTML survive? 28
Java faces the real world 30

FORUM 50

EDITORIAL 8

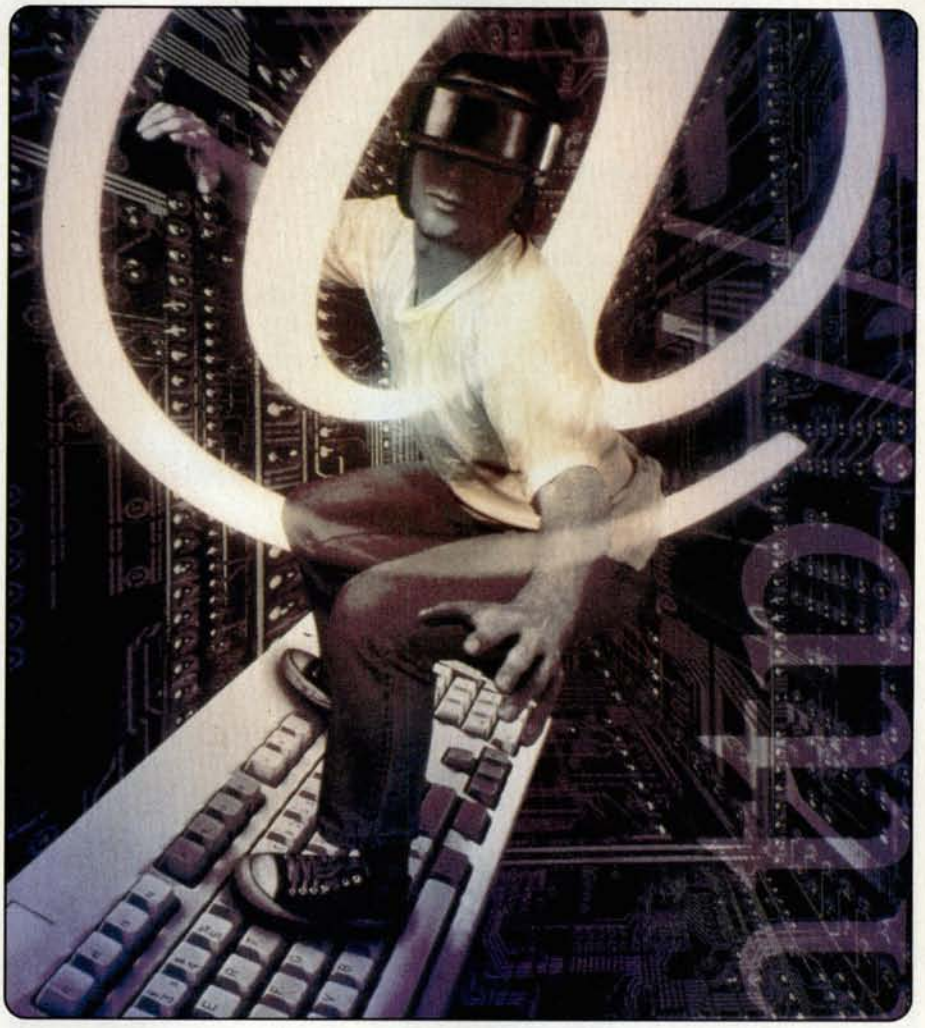
READERS' SAY 50
TWO BITS WORTH
Helen Dancer
Election fairytales 52
Jeremy Horey
Good-enough software 54
Jeremy Torr
The other big Australian 56
Dan Tebbutt
Riding on Telstra's curtails 58

PRICE WATCH
Modem check 59

SERVICE AND RELIABILITY
Winning them back 60

CORPORATE
The search for meaning 62

REPROGRAMMING
Old but not out 64



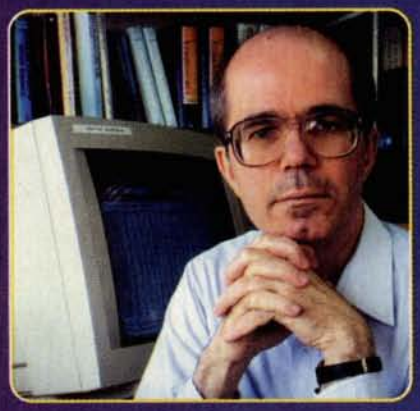
INTERNEXT

Web phones, MPEG-4, multicasting, DSL . . . *APC* looks at where the Internet is heading. Find out how you will access the Net in the years to come and how advanced networks are being developed for universities and research institutes that have already outgrown the Internet. 72

Market pressure is streamlining the ISP market; there's no longer a quick buck to be made from shoddy service. ISPs are now offering more than just access, they're building member communities and extending their range of services. *APC* Labs tested 20 ISPs to give you the complete run-down on how they rate. 103

Performance is not everything — service with a smile can make a big difference. The results of our ISP Service & Reliability survey 1998 reveal which ISPs readers think stink and why. 140

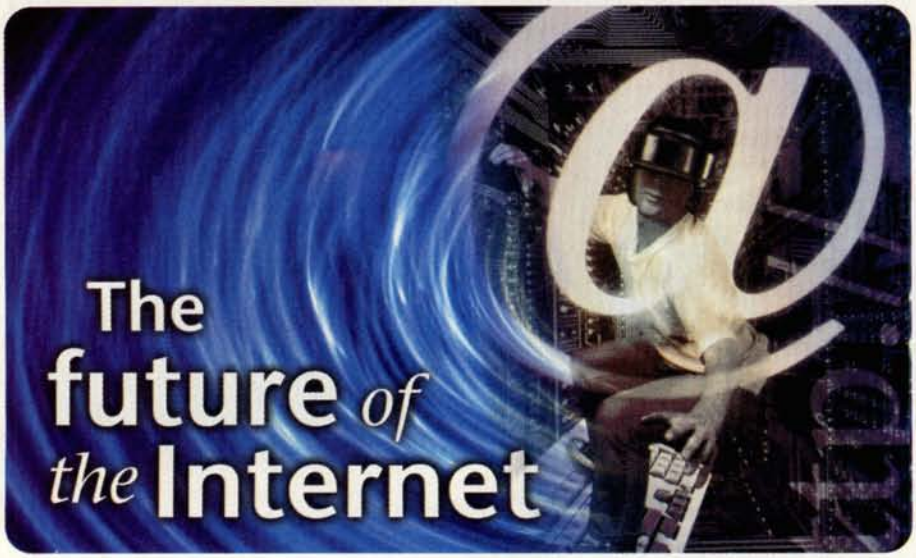
PROFILE 67



QUALITY AND EQUALITY

Researcher Andrew Odlyzko from US long-distance carrier AT&T argues against those who suggest the Net should take a 'pay for what you get' approach to service. He says as an alternative to differential levels of service, everyone should be treated better, not just government and business.
By Dan Tebbutt

FEATURE 72



Find out where the Internet is spreading its tentacles next. 72
By Nathan Taylor
The research networks 73
Faster paths to the Net 76
By Nathan Taylor, Selina Mitchell and Simon Vandore
Seven key Internet technologies 86
By Dan Tebbutt and Nathan Taylor

TECHNICAL 99

TRYING YOUR LUCK ONLINE

Gambling with Java, digital certificates and virtual roulette.
By Josh Gliddon

INTERNET 103

HOW THE WEST WILL BE WON

Market pressure is driving out the Internet service cowboys. 103
By Josh Mehlman
Editor's Choice 106
How we tested 114
AOL Australia arrives 118
Better service, bigger bucks 122

Your ISP's service: How does it rate? 140
Results from our ISP Service & Reliability survey 1998
By Roulla Yiacoumi

Access One 104
CompuServe Pacific 104
Connect 104
DIALix 106
Dynamic Bell's NetWorld 106
EISA 110
Geko Internet 110
GigaNet 112
IBM Internet Connection 112
Magna Data 112
Mira Networking 112
Netspace 114
OzEmail 116
Planet Internet 120
Switch Telecommunications 120
Telstra Big Pond Home 124
TIG 124
TPG Internet 126
Zip World 128

WINNER

Jason Faulkner is the lucky winner of *APC*'s subscription prize of a trip for two to Hong Kong and London with accommodation included, organised by Traveland. He is pictured below receiving his ticket from Luke Crosthwaite, Commercial Co-ordinator of Traveland, and Michele Roach, Senior Editor of *Australian Personal Computer*. The subscription promotion was featured in our June, July and August 1998 issues. All new subscribers (including renewals received during this period) were entered in the draw. If you subscribe to *APC* this month you could win an IBM ThinkPad 600 valued at $6,305. Turn to page 144 for further details on how to subscribe and be entered in the draw to win the ThinkPad 600.

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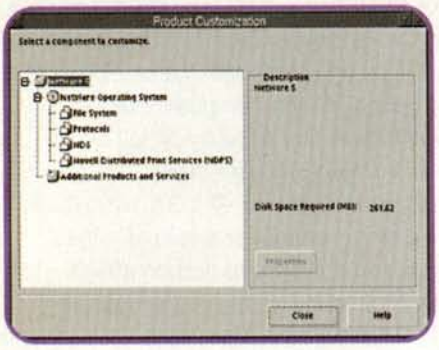
LGE047 APC

FIRST TAKE 32

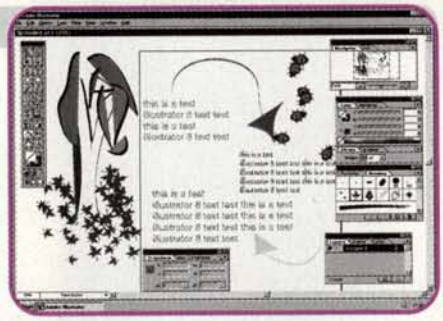
NOVELL NETWARE 5
Network operating software. 33



LOTUS NOTES 5.0
Big promises from Lotus for its groupware update. 36

COMPAQ ARMADA 6500 & DELL INSPIRON 7000 D300LT
We compare two notebooks for power-users. 40

ADOBE ILLUSTRATOR 8
The latest release of the popular graphics program. 42



IXLA WEB EASY
An Australian drag-and-drop Web editor. 44

PHILIPS BRILLIANCE 151AX
Low-cost LCD monitor. 46

SYMANTEC NORTON GHOST 5.1
Hard drive backup software. 46

FUJIFILM MG-16S SMARTMEDIA AND FD-A1
File transfer system for digital cameras. 48

SYMANTEC TALKWORKS PRO 2.0
Fax and voice mail software. 48

THE GADGET FILE 44

AFTER HOURS 203

BIBLIOFILE
Get the look 203
Perspective: Distance divided 206

INTERACTIVE
Mulan Animated StoryBook, based on the Disney movie; plus other titles 207
Interactive News 208

GAMEZONE
Heart of Darkness; Leisure Suit Larry's Casino; SpecOps Ranger Assault; plus more 209

WEB FILE
Archive it 213
Surfbaud: Cataloguing knowledge 214

CHIP CHAT
Flynt gives Starr the thumbs up 216
Contest: Technology Gag of the Month 216

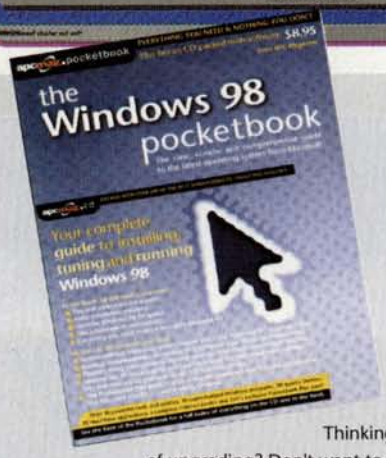
ADVERTISERS' INDEX 14
CD CONTENTS 16
CREDITS 18
CD INFORMATION 209
CONTACT INFORMATION 18, 209

WORKSHOP 141

CONTENTS
Contest: Bug of the Month 149

TECH TALK
Technobabble: The graphics card 150
By Nathan Taylor
Step by Step: Getting sound right 152
By Daniel Rutter

OPERATING SYSTEMS
Windows 95: Plug and Play 155
By Kieran McNamee
OS/2: Directories and extended attributes 160
By Christopher Relf



Thinking of upgrading? Don't want to wade through volumes of expensive books looking for the right guide? Look no further! The *Windows 98 Pocketbook* has everything you need and nothing you don't. **On sale NOW!**

Mac OS: Contextual menu modules 163
By Stephen Withers
Linux: FTP servers 168
By Geoffrey Bennett

PROGRAMMING
Developers Corner: Demo versions 170
By Michael Smith
HyperText: Intranets 174
By Lee Borkman

SHAREWARE
Shareware summary 176

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Advertising index

Adaptec	25
Ado Electronics	154
Alfa	OBC
American Power	129
AOL	108, 109
Apple Centres	83
ASP	119
Canon	37, 39, 41, 43, 45, 47, 49, 51
CV Video World	141
Checkmark	173
Corel	85
Cybec	120, 122, 124
Daewoo	34
Dell	IBC,IFC, gatefold, 23, 57, 137
Dynamic Bell	110
Elite	161
Epson	97
Focal Point	125
Gateway	4, 5
GCC	70, 71
Gigabyte	133
GT Interactive	102
Hallmark	171
Hearne	148
Hyundai	131
IBM	6, 7, 15, 61
Intel	88, 89, 90, 91, 93
Iomega	31
IT World	121
KOA	81
KYE	98
LG Electronics	17
Macase	66
Magtron	165
Microgram	215
Microsoft	29
Mira Networking	116
Mitsubishi	69
MSI Computers	143
Natcomp	117
Net Registry	113
Netspace	105
Northern Territory	77
Ocean Office	158, 159
OKI	127
Optima	111
Panasonic	75
Philips	32
Powerquest	78
Ricoh	55
Samsung Electronics	53, 87
Sega	123
Servex	11, 63, 101
Sony	27
Symantec	65
Tang Computers	118
TDK	115
Telstra Big Pond	2, 3, 128
TPGI	107
Ulead	139
United Satelitte	14
Viewsonic	20
Westan	13
CHANNEL	
AVO	177
Beyond	178
Edge	179
Global	180
SUPERMARKET	
Kookaburra	181
City Software	182, 183
New Reality	185
Dragon Dictate	186
Mosa	187
Q Plus	188
Beam	189
Nat Com	190
Sigmacom	191
ACT	192
Corp Software	194, 195
Rosemary Media	211
MARKETPLACE	**196-207**

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Coming up

- The annual December PC reviews. This time around we review more than 25 of the hottest machines in two categories: under $2,000 and 'ultimate systems'.
- Mobile telecommunications technology: Confused about the life span of the analog network? *APC* looks at the future of mobile technologies. Will satellite win? What about the digital standards mess? And where do pager services fit in?
- Web phones: The melding of telephone and computing technologies is not far away.
- Profile: Dan Tebbutt talks to investment banker and computer science theorist, Nick Birrell.

Plus: A controversial look at the biotech revolution, holiday games reviews, interactive Christmas presents and more.

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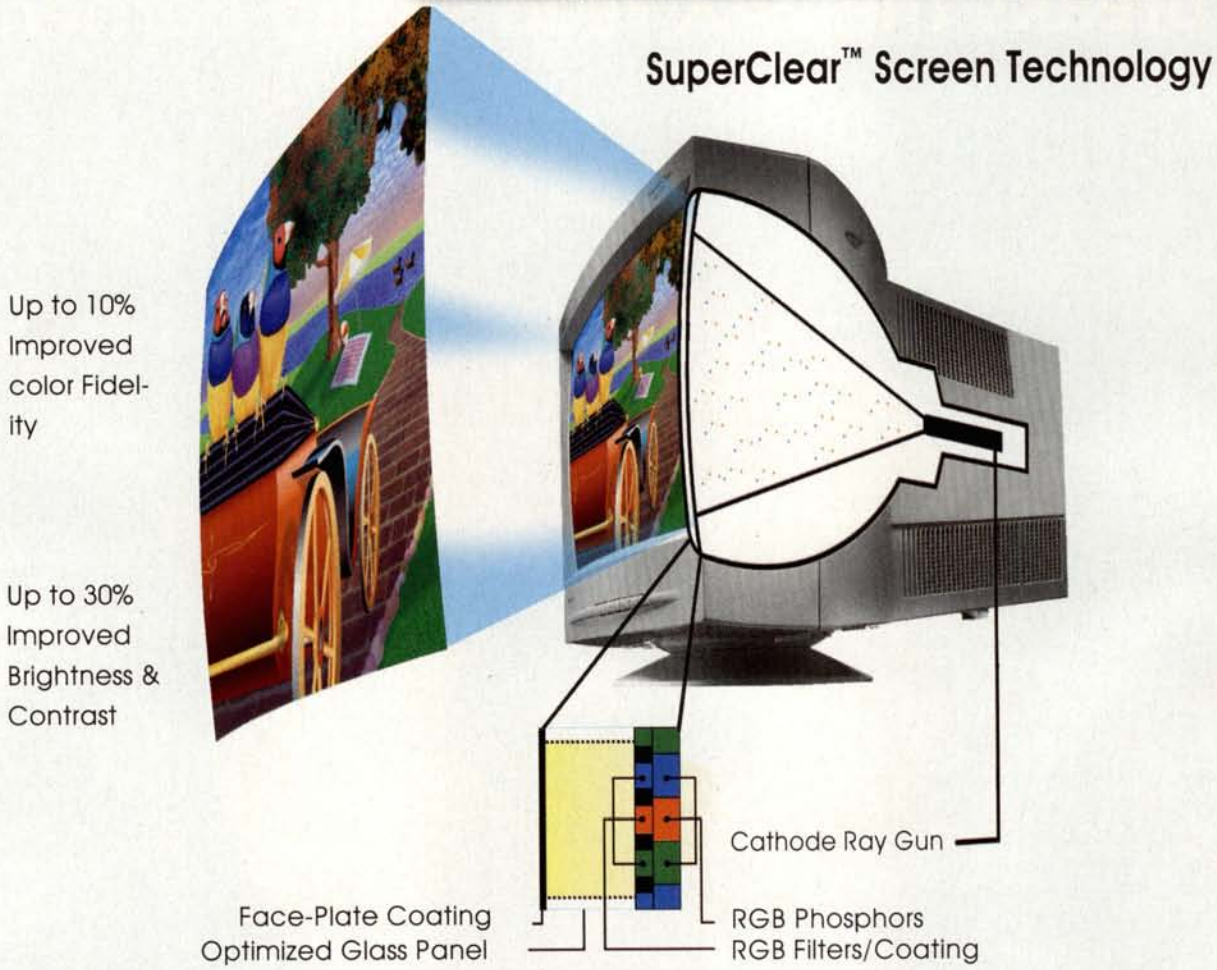

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Max. Resolution	1280x1024	1280x1024	1280x1024	1600x1200	1280x1024	1600x1200	1800x1440
Recommended Resolution	1024x768@ 87Hz	1024x768@ 87Hz	1024x768@ 87Hz	1280x1024@ 88Hz	1024x768@ 87Hz	1600x1200@ 76Hz	1800x1440@ 76Hz
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LINUX INVASION

Windows faces new threats

Although Microsoft claims to have sold more than 2.5 million copies of Windows 98 since its launch earlier this year, the desktop environment is facing a new series of challenges.

Linux's growing following is now translating into serious interest from major computing firms, which are also expressing growing discontent over the stranglehold Windows enjoys over the market.

One sign of Linux's mounting importance to IT is the increasing sums invested in it by big players. Commercial Linux developer Red Hat announced in late September that IT brand names Intel and Netscape, along with investment firms Greylock and Benchmark, have taken a minor equity position in the company (the exact amounts were not disclosed).

Red Hat director of support services Robert Hart predicts that Linux will increasingly make inroads on the desktop space. "We are starting to see Linux move to the desktop," he said. "I would not recom-

Continued on page 22

THE SLOW, SLOW SWITCH

From analog to digital

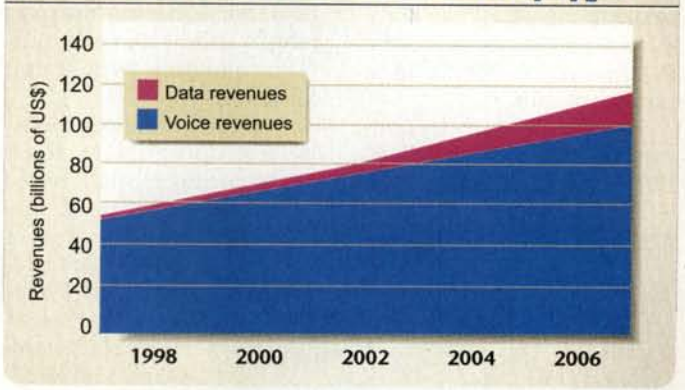
The future form of Australia's communications networks remains up in the air. New digital technologies are being heavily promoted even as the life span of the analog mobile network is extended.

The switch-off date for Australia's analog mobile phone network has been delayed by 12 months, following an agreement between the three major carriers.

The analog network will remain in operation until December 31, 2000. The plan to switch to an entirely digital network spelt bad news for remote areas, where digital coverage is less complete and the range of each base station is reduced. Earlier this year, the Federal Government announced a review to select areas to extend the analog service, where digital was deemed to not be economically feasible.

Originally, most mobile phone users were expected to be moved onto the digital GSM network, but Telstra complicated the equation in July by announcing plans to offer a CDMA service to rural users.

Mobile revenues in Asia-Pacific by type



One concern, which remains, is that CDMA equipment is generally more expensive for users than the analog alternative.

Not all vendors are depressed by the squabbling, however. Competing standards will not slow the uptake of third-generation (3G) mobile technology in Australia, officials from Ericsson predicted. Ericsson senior network specialist Larry Wood said that the biggest challenge to developers of 3G mobile technology is ensuring that they will work with existing GSM and analog systems. "We realise that there is a lot of worldwide investment today in the GSM and D-AMPS technology," he said. "We have built in as much integration with previous networks as possible."

Wood said that the foundations for 3G technology are already being laid. GPSR, one of the first 3G developments, will be available in 1999 and will provide GSM users packet-based data rates of 115Kbps. The next stage, edge technology, will allow GSM operators access to wireless multimedia,

Continued on page 22

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AUSTRALIA'S TECHNOLOGY NEWS

Windows faces new threats

Continued from page 21

mend it for [general office use], but it is getting there."

Intel's investment in Red Hat is part of a general move to promote its commitment to Unix and other operating systems. Intel is spearheading a scheme to create a uniform device driver interface for Unix; it aims to overcome the common complaint that hardware developers have to write multiple drivers for different versions of Unix.

And Intel's plans to standardise Unix don't end there. "We're starting discussions to develop a Unix design guide for servers", along the lines of the PC specifications for consumer systems developed in partnership with Microsoft, server marketing manager for Intel Asia-Pacific Peter Van Deventer said. Such a document was scheduled for early next year, he added.

Van Deventer said that while Intel has long supported Unix as a platform — "our fundamental position is that we're OS-neutral" — interest in the OS has grown since 1994, when the company specified a standard design for high-volume servers. The company is still continuing to work with Microsoft to support Windows, but documents in the ongoing Microsoft antitrust case suggest that Intel's relationship with the software giant has not always been a happy one.

Perhaps with that in mind, Intel is also attempting to woo the growing community of Linux users. Last month, the company demonstrated a four-way system using Pentium II Xeon processors running Linux, Van Deventer said.

Netscape has also been increasingly Linux-focused. Earlier this year founder Marc Andreessen predicted that Linux would become the company's third reference platform, alongside Win32 and Macintosh.

Vendors are also expressing their discontent. Microsoft has frequently proclaimed the benefits of the unified driver architecture provided by Windows, but it seems that not all hardware manufacturers feel quite the same way.

Lexmark consumer printer division general manager Steven Jegier told *APC* that some of the features which Lexmark wanted to incorporate into its printer drivers, especially those aimed at simplifying use and troubleshooting, were not possible because of the architecture imposed by Windows. "It's amazing how much we're restricted by that," he said.

The printer company is far from alone in its complaint. One of the issues raised in the antitrust case brought against Microsoft by the US Department of Justice has been the restrictions imposed on PC vendors that want to customise the way in which Windows boots. Microsoft claims that this control is essential to maintaining a consistent user experience, but vendors, particularly in the consumer space, would like to offer a greater degree of customisation.

Angus Kidman and Dan Tebbutt

From analog to digital

Continued from page 21

IP services and applications at speeds up to 384Kbps.

Wood said that WCDMA (wideband code-division multiple access) technology will increase radio data transfer beyond the speed of Web browsing. With wireless transfer of multimedia, he predicts the development of small palmtop units for videoconferencing and other Web-specific applications.

Wood conceded that although WCDMA and other 3G technology would revolutionise mobile communication, a mixture of three standards will probably eventuate. The key standards, according to Wood, will be WCDMA, edge and CDMA 2000.

He also stressed that WCDMA should not be confused with the existing narrowband CDMA technology promoted by Telstra, which is backward compatible with existing GSM and D-ASDM standards. Wood said that once mobile operators had moved from existing standards to 3G technology, there should be no need to offer backward compatibility.

It may be some time before these problems spill into the area of data transmission. Mobile data services will grow strongly in the Asia-Pacific region over the next decade, but conventional telephone networks are likely to retain the lead in data traffic, according to a report from research firm Ovum.

Data services will account for 12% of regional cellular communications revenues by 2007. Currently running below $US500 million, Asia-Pacific cellular data services yearly revenue is predicted to rise to about $US13 billion. Although "demand is uncertain and unproven", Ovum expects major growth in packet data services from 2003, accompanied by stagnating circuit-switched data and Short Message Service use. By 2007, Ovum forecasts 63 million cellular data subscribers in the Asia-Pacific region, of which 56 million will be packet data users.

This represents a substantial market, but it still leaves voice dominant in the mobile communications arena. In landline-based communications, the pattern has already been reversed. Telstra has predicted that data traffic will exceed voice traffic on its network by the end of this year, and will be five times larger by 2000.

Nonetheless, the use of data services may substantially change the mobile market. "The adoption of a packet architecture will mean enormous changes for the operators, both financially and for the organisation. The two key areas which will determine how the market for cellular data services develops are the level of customer acceptance and the level of integration of service components which will require effective cooperation between hardware and software vendors," Ovum analyst John Davidson said.

The biggest challenge to developers of 3G mobile technology is ensuring that they will work with existing GSM and analog systems.

Angus Kidman, William Maher and Stephen Withers

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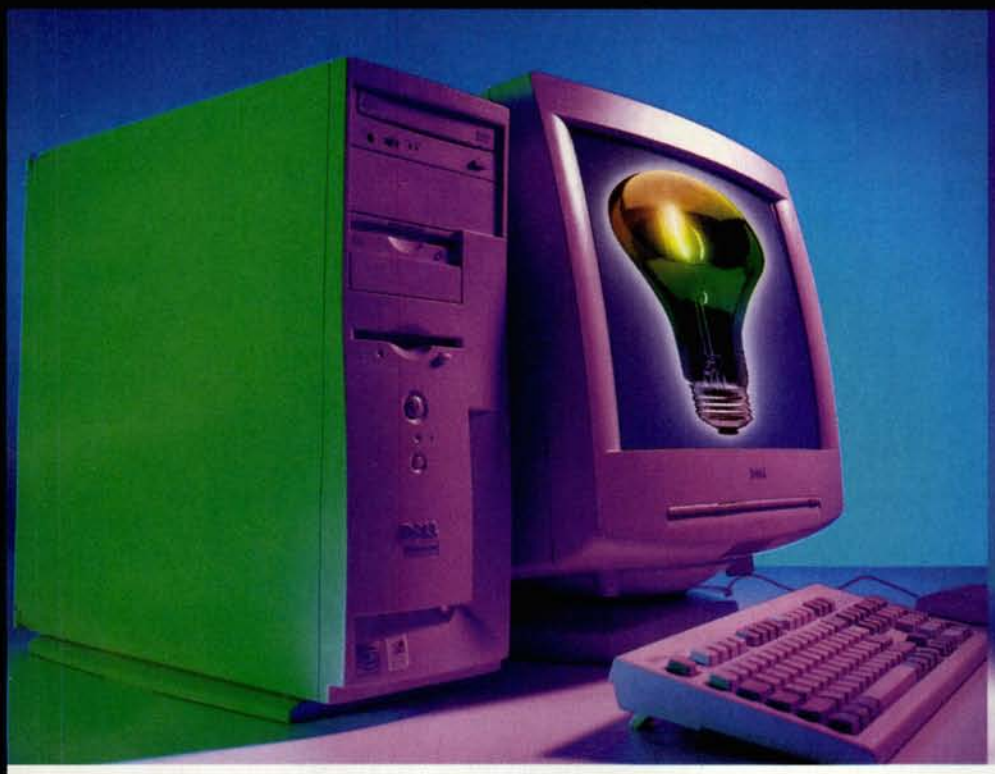

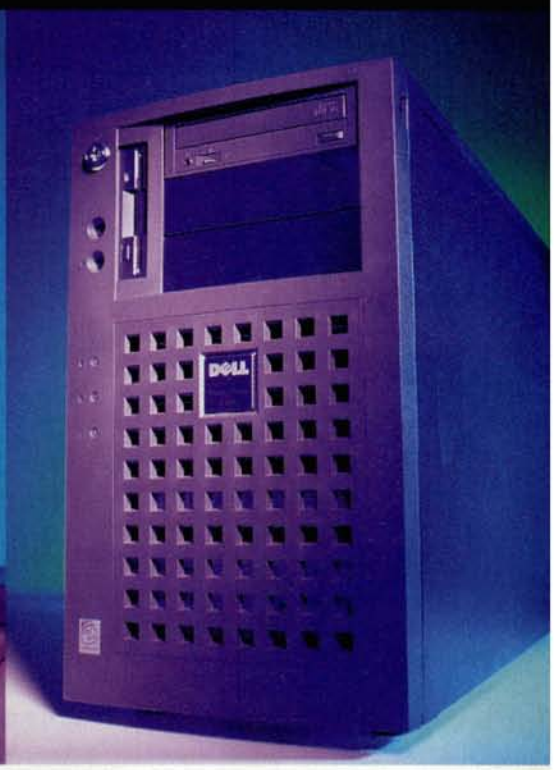

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MANY USERS, NO CLUE

Australia lags online

Although Australia is predicted to have one of the highest rates of Internet uptake by the turn of the century, businesses are still struggling to come to grips with its potential.

By the end of 2000, there will be more than 300 million regular users of the Internet; and despite major world growth, Australia will still be ranked in the top 10 countries in terms of Net use, according to new figures from the Internet Industry Almanac. Within the Asia-Pacific region, Australia will be a major force, its 8 million users placing second only to Japan.

Despite that high uptake, Australian executives are lagging behind in terms of Net use, a study has found. Andersen Consulting found that only 80% of the Australian executives they surveyed had access to the Net. The global average was 90%. Only 37% of Australian executives were comfortable using the Web.

Nonetheless, large firms are still outstripping small businesses as IT users. As part of its business growth and performance survey for the 1996/97 financial year, the Australian Bureau of Statistics found that 62% of businesses overall used computers, and one in three had had them in place for five years or more.

The lowest rates of computer use were recorded in small businesses, and the differences became even more dramatic when Internet use was factored in. Twenty-one percent of companies overall have Internet access, compared with 85% of large firms. Email and information gathering were reported as the main uses of the technology.

Angus Kidman and William Maher

Net usage in 2000

Rank	Country	Users (millions)
1	US	132.3
2	Germany	22.9
3	Japan	21.9
4	UK	17
5	France	12.6
6	Canada	11.6
7	Italy	10.6
8	Australia	8
9	Netherlands	5.4
10	Brazil	5.2
11	Russia	5
12	Spain	4.4
13	China	3.8
14	Sweden	3.7
15	South Korea	3.2
	Total	**267.5**

Source: Internet Industry Almanac

FOCUS NEEDED

IT research deemed short-sighted

The pursuit of short-term goals is placing the long-term potential of technology research at risk, a leading academic has warned.

"IT research internationally is suffering somewhat," Karl Reed, Associate Professor at La Trobe University, told *APC*. "It's tended to suffer from the absence of forward thinking. In the area of browser technology and Web search technology, for instance, it's very reactive and needs some long-term delivery objectives. The paradigm for delivery at the moment is to think of something new and get it into the market quickly. That isn't necessarily the right approach."

Reed is the director of the technical board of the Australian Computer Society (ACS). In that position, he has spearheaded a push for the government to establish dedicated IT research institutes, pointing to the fact that while primary industry and IT exports earn similar amounts for Australia, the former is much better supported through organisations such as the CSIRO.

"If you include telecommunications and broadcast media, the IT sector is substantially larger than primary industry, yet the amount spent on R&D in this critical field is significantly less," he noted. Current spending on primary industry research is about $900 million, and the CSIRO has more than 10 divisions which address primary industry issues, but no single division dedicated to technology, he said. "The best approach would be to establish a major national organisation dedicated to IT research."

Reed said that the CSIRO had done "tremendous" work for agriculture, but had not been so successful in developing technology research. For that reason, it would be preferable to establish a separate institute, although this would be a time-consuming process.

Working through universities would not be enough to give Australia a leading role in technology development, Reed said. "There's a big difference between the kind of research activity that can be sustained at a university and the kind that can be done by [an institution] like CSIRO" where there are no outside distractions to research, he noted.

Angus Kidman

News Roundup

Criticism of a proposal to create a National Authentication Authority (NAA) continues to grow, as more industry groups call for greater government involvement in ecommerce regulation. The Certification Forum of Australia (CFA) has made public the contents of its response to the proposal, which was formulated by the National Office for the Information Economy (NOIE) in August. NOIE has advocated a low-key approach to authentication with the bulk of work done by commercial entities, which the CFA believes is inadequate. "Government involvement in establishing a framework for the recognition of digital signatures is essential for the growth of electronic commerce in Australia," the body commented in a statement.

Q: What takes one year and about $30 million to grow? A: AOL's Australian service, which promises to bring Australian consumers online like never before. AOL Australia CEO John Cookson said the service offers something "new and unique" to Australians. "Consumers aren't interested in the technology that makes these things work," said Cookson. "They just want to get online."

AOL has gone to market with two pricing options, but a flat rate plan isn't available, despite such options in the US and Europe. AOL decided against offering a flat-rate plan because UK market experi-

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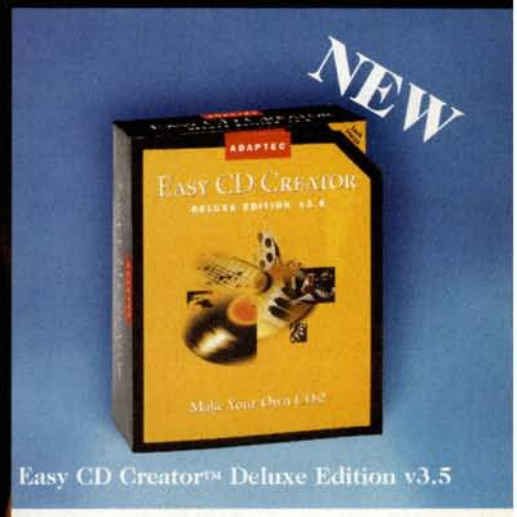

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WEB WAIT

MLPPP no clear path

Australian ISPs are still considering how to make the best use of a networking protocol which could significantly improve throughput for businesses using a single Net connection.

The Multilink Point-to-Point Protocol (MLPPP), which allows multiple network users to access the Net through a single device and can also increase bandwidth by combining Net connections, has existed in various forms for a number of years. It is only recently that Australia has had access to network devices and other products which take advantage of the protocol, but ISPs are still displaying mixed reactions.

OzEmail representative Michael Ward said the company had no immediate plans to provide MLPPP connections just yet. "It's extremely efficient, but you don't want to introduce protocols that aren't consistent," he said. Ward said that OzEmail would wait for the IETF to draw up official guidelines for MLPPP before offering services that used the protocol.

Gary Malkin from the Internet Engineering Task Force (IETF) said that a draft standard for MLPPP has been approved. However, he added that there was a general consensus within the IETF that there was no need yet for a general standard. "Every vendor has a proprietary solution. Naturally, I don't agree with this position, but majority rules," he said.

Geoff Huston, chief Internet technologist at Telstra Big Pond, said that Big Pond Direct has supported multilink connections for some time. "The beauty of it is that it is not dependent on networks and standards," he said.

Huston said the connections have been most popular with ISDN users, who are able to bundle their lines together to produce either 128K, 256K or 512K connection speeds. He added that other systems were based on proprietary standards and could not be used across different platforms and systems.

Despite the fact that MLPPP connections are not common in Australia, it is expected that use of the protocol will soon increase. Ramp Networks, which recently added MLPPP support to its WebRamp routers, expects that the market for multilink devices will soon double.

According to company representative Tim Sullivan, MLPPP will soon become a preferred alternative to leased lines. "In the past you really had to go to leased lines, and that's really expensive," he said. "What we're saying is that you can do that now with a $500 router."

William Maher

$4 BILLION PROBLEM

Mounting costs of Y2K apathy

Estimates of the financial and social cost of the millennium bug continue to rise. New research suggests that the cost to Australian businesses of simply rectifying the problem will top $4 billion.

An analysis of figures submitted to the Australian Stock Exchange earlier this year by Deloitte Touche Tohmatsu found that the top 150 companies in Australia (ranked by market capitalisation) would each spend an average of $26.5 million countering the problem.

Such figures need to be placed in perspective. Research by IDC found that the total global cost of rectifying the millennium bug, measured from 1995 to 2001, would be $US296.74 billion. This only represents 2.9% of total global IT spending over the same period, officials said.

Information campaigns are not proving as effective as hoped. In Victoria, for instance, information kits were distributed to 130,000 SMEs, and by September 4, over 4,200 calls had been taken by the Millennium Bug Hotline. However, a callback survey of over 2,500 of these callers revealed that while 92% passed on the information they received to another person, about 40% had taken no action following their call.

Spending on the problem will peak this year at $US87.42 billion, or about 6% of the total amount spent on IT. That figure varies from region to region, however; in Asia-Pacific, peak spending will occur in 1999 because of the economic crisis, and in Europe spending is currently higher because Y2K work is being combined with euro conversion projects.

Karl Feilder, CEO of Y2K tools developer Greenwich Mean Time, has predicted widespread chaos as a result of the problem. Fiedler estimated that only 2% of all PCs in use today — "a figure put at around 400 million" — had been tested to see whether they could handle the date changeover.

"It's not about compliance, it's all about managing the risk. Every PC, and every single piece of data, needs to be checked," Fiedler said.

Josh Gliddon, Angus Kidman and Stephen Withers

News Roundup

ence showed most customers preferred to make a small upfront outlay and then pay for extra time used, said AOL International president Jack Davies.

NSW Minister for Education John Aquilina has announced that HSC results will be put online for the first time in January next year. This follows a trial last year of a special telephone service providing HSC results. Aquilina said students will access their results by entering a student number and PIN. He said that the security used to protect the HSC results would be similar to that used by banks for secure transactions.

Looking to sell a few PCs in the local market? It seems selling direct — bypassing the traditional retail/reseller model in favour of direct salespeople, telephone and Internet sales — is the way to go. Research by Gartner Group shows that while total PC sales in the Asia-Pacific region for the first half of the year are up just 3% on the same period in 1997, shipments via direct channels are up 15%. A total of 1.6 million machines were sold in the region via direct methods. Sales through resellers were higher, at 2.7 million units, but this was down 3% on the same time last year.

For complete versions of these and many other stories, be sure to check into http://newswire.com.au.

The camera.

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The world's first and only floppy disk digital camera has just been improved. It's a Sony of course. The new range of Sony Mavicas not only let you shoot a picture straight onto disk, but the FD81 and FD91 (avail. Oct. 98) even let you capture up to 60 seconds of moving footage. So now your photos and multi-media presentations can be that much more moving. **It's a Sony.**

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Dynamic HTML has yet to set the world on fire, and there's no obvious relief in sight.

Can DHTML survive?

Last year, dynamic HTML (DHTML) was being heavily hyped by both Netscape and Microsoft as the key to providing active, application-like Web pages. However, battles over standardisation have taken much of the wind out of DHTML's sails, and its status as the Web technology *du jour* has been claimed by XML. Is anyone now actively using DHTML, and what is its future?

In a nutshell, DHTML makes it possible for HTML — the code that a browser uses to lay information out on a Web page — to change after the page has finished loading. A simple example of DHTML would be an icon that changes when the mouse pointer moves over it; a more complex example would be a page that lets the user move elements, such as pictures, around.

These features aren't unique to DHTML. JavaScript and Java applets can be used to make a Web page more than a simple static entity. Both, however, have disadvantages: in the example of the mouseover icon changes, JavaScript requires that two lots of scripts, as well as two icons, be loaded for every possible change. Java's downside is the relatively high bandwidth requirements of Java applets, which make it less than attractive for developers writing pages for low-bandwidth applications.

DHTML has been positioned as a solution to both the high bandwidth requirements of Java and the unwieldiness of JavaScript. DHTML offers low bandwidth, it adheres to a W3C standard, and it is relatively simple to write the code.

With all these things in its favour, DHTML should be setting the world on fire — but isn't. Searching reveals few Web sites using DHTML. Even such cutting-edge technology sites as Ziff-Davis' ZDNet use JavaScript to obtain dynamic effects. (Java is used even less often, its power largely confined to gimmicky applets and 'proof of concept' examples.)

Developers are steering clear of DHTML, as the big two browser makers don't agree on how DHTML should be handled. The source of this disagreement can be traced to the differing Document Object Models (DOMs) used by Microsoft and Netscape. Some may find it surprising, but Microsoft is not the baddie in this instance, since its DOM adheres much more closely to the W3C standard than Netscape's does.

The DOM is a framework that defines how page elements are represented and the attributes that can be associated with a given page element. The DOM allows page elements to be changed because it exposes them to a scripting language; in this case, the scripting language is DHTML. The DHTML-powered mouseover works because the DOM allows DHTML to associate a change in state (a change from non-highlighted to highlighted icon) with an action. The action, in this case, is the user passing the mouse over the icon.

Without an agreement on DOM, the problems are obvious: put simply, Netscape's DOM works differently to Microsoft's. Up until IE4, Microsoft's was also somewhat different to the then unratified W3C version, and as a result, Web developers weren't able to implement DHTML in a cost-effective manner.

The upcoming versions of Netscape Communicator and Internet Explorer are expected to adhere to a standard W3C DOM, which may light a rocket under the Web development community and rebuild enthusiasm for DHTML.

Lowest common denominator

To date, DHTML hasn't set the world ablaze; it all comes down to the lowest common denominator. "There are lots of companies out there still using Version 2 browsers, and they're not going to change just to take advantage of something like DHTML," said Ruby Blessing, intelligence director for one of Australia's most successful Web development houses, Spike Wireless.

"In the end everything we do has to be backward compatible to take into account the lowest common denominator," she added.

Spike views Java as a stopgap measure more suited to intranets and extranets where there's a defined need for its capabilities and where the technology is a known factor. Technical development manager for Presence Online, Adam Ginsberg, agreed. "We'd use Java in an extranet site where the functionality is needed," he told *APC*. "Java's pretty robust cross-platform-wise, and we know that using Java we can build a site that will degrade smoothly back to flat HTML if the browser can't handle the Java."

Ginsberg said his company built some proof-of-concept DHTML sites, but the disadvantages associated with the browser incompatibilities meant it was a choice between building three different versions of a site — one for Netscape, one for Microsoft and one for early browsers — or not using DHTML at all. In this case Presence Online backed the obvious horse, and decided against using DHTML as part of its development kit.

"The great thing about DHTML is that it's much more efficient than either JavaScript or Java," said Blessing. "We are starting to ramp up to use it, but those compatibility issues [between Netscape and Microsoft] really need to be resolved."

Less easily solved is the problem of backward compatibility with older browsers, and the large installed base that's simply not going to change for change's sake, she said. "We're seeing more of a pick-up, but in the end, we simply need to make everything backward compatible."

Josh Gliddon

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In a post-hype environment, can Java cut it?

Java faces the real world

Sun is continuing to pour major resources into Java, but even the company which created the cross-platform programming phenomenon sees a difficult road ahead before the technology becomes truly widespread.

"If you think that at some point we'll say 'we're done: this is it', that's not the way software works," Java inventor James Gosling told *APC*. "These things are more like organisms. We have been delivering versions of the platform technology over the last three years and they're getting progressively more robust. Java applications are now used in enterprises as mission-critical components."

One fundamental issue for Java continues to be performance. At the opening of Sydney's Java@Work conference in September, Sun officials confirmed that the next release of the platform, Java Development Kit 1.2, had been delayed because of concerns over speed and reliability.

Gosling said JDK 1.2 was proving "quite a trial", and Sun was devoting considerable quality assurance time to getting it right. "The fundamental problem is that there's lots in it," he said. "We're making a big effort to push performance up and memory requirements down. We want to ship an industrial-strength product rather than a prototype."

Gosling said performance development was coming along well. Initial releases were optimised for portability rather than performance, but just-in-time (JIT) compilers have pushed the language to levels comparable to native C programming. Platform developers such as Novell, Intel, Microsoft, SunSoft and Apple continue to improve Java virtual machine (JVM) performance. Competing claims about whose JVM is fastest are evidence of a competitive stimulus, Gosling added.

Much of Sun's current engineering effort centres on HotSpot, a generic JIT compiler that will be integrated into JDK 1.2. HotSpot analyses code and "observed behaviour patterns" to optimise execution on the fly, Gosling explained. But Sun has had to work hard to shake out bugs and monitor quality assurance for HotSpot.

"It's a pretty rocket-science machine," said Gosling. "There are many PhD theses in this compiler. It's wild technology."

Sun is also working with hardware developers to accelerate Java on microprocessors, but Gosling emphasised the language would remain in cross-platform bytecode format. "Java decouples hardware and software innovation," he said.

Gosling also admitted that the promise of 'write-once, run-anywhere' (WORA) application development has not yet been fulfilled. Delivering the opening keynote at Java@Work, Gosling said the early attempts at WORA were "shaky" but the outlook should improve as platform developers take charge of Java run-time environments.

Cross-platform compatibility was especially rocky in Java Development Kit (JDK) 1.0.2 and browser implementations, Gosling said. "There are still people out there feeling pain [trying to get] things to work in Netscape and Internet Explorer, but outside that people writing to modern VMs [virtual machines] are doing well," he said.

The ability to write applications once and deploy them across multiple platforms without porting is one of the most appealing aspects of Java, but programmers have found that the reality falls short of the hype. Major Java development projects at companies like Macromedia and Corel were halted after becoming caught in a tangle of incompatibility. Critics changed the slogan to 'write-once, debug-everywhere'.

Much of the problem stemmed from the notorious Abstract Window Toolkit (AWT) user interface builder. Gosling said AWT had too many platform-specific problems so Sun moved to the new Swing GUI toolset that allows developers to create their own look and feel through plug-ins.

But Gosling remains confident that WORA will improve as operating system vendors become the main sources for JVM technology. Browser developers are now starting to develop standard interfaces to the JVM from the underlying OS. "Platform vendors are helping a lot — with one notable exception," said Gosling, referring to the compatibility dispute with Microsoft, which was still in the courts as *APC* went to press.

In addition, Java developers have been urged to start thinking beyond the millennium bug to conceive the type of networked applications that will dominate the next stage of computing. Sun's Java evangelist Miko Matsumara said that programmers should begin imagining the future of distributed network applications and start working with technologies like Jini — the new "spontaneous networking" technology that allows any Java-enabled device to present a common network interface.

"I want you to look past the Y2K issue and beyond the Olympics where Australia will win all the swimming medals, and start thinking what's beyond that," said Matsumara. He said four major trends would affect future computing technologies: new microprocessor approaches, more bandwidth, network value transfers and the new software infrastructure.

Matsumara said the new software infrastructure would involve much more distributed intelligence, just like the human brain. "There's a tremendous complexity in the distribution of intelligence in the human brain," said Matsumara, a trained neuroscientist. "If you ask where the intelligence is, you can't really point to a single place that has it all. Distributed computing networks will work more like that."

Sun's chief science officer John Gage said Jini would provide the technology to create new value networks. Jini is likely to be marketed under the name JavaTone.

Dan Tebbutt

Dan Tebbutt travelled to Java@Work as a guest of Sun Microsystems.

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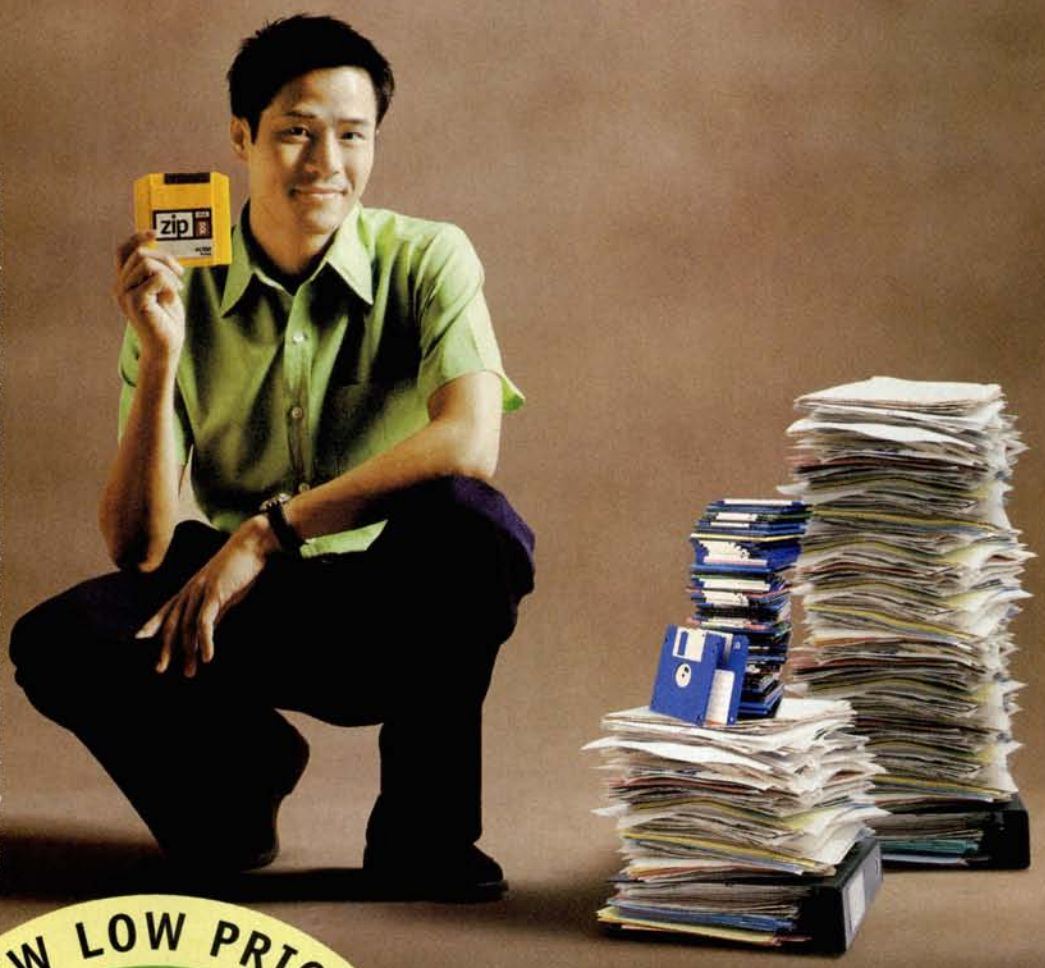

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Let's make things better.

A lot has happened since we looked at Alpha 1 of NetWare 5 in September last year. So how does the final release shape up?

Novell NetWare 5

With its first major update since intraNetWare (4.11), Novell is well positioned to take advantage of Microsoft's slipping deadlines for its NT 5 release.

NetWare 5 has a host of new features, including support for IP as a core protocol — it doesn't use IPX encapsulation for the transport of NCP (NetWare Core Protocol) over the wire. This feature alone makes NetWare 5 of interest to enterprise networks that prefer to run only TCP/IP.

We installed NetWare 5 onto an IBM Netfinity 7000 with 2G of memory and a 20G disk array, and performed an upgrade from intraNetWare running on a Data General Aviion Pentium 200 with 64M of RAM and two 4G SCSI drives. In both cases we found the installation had been streamlined over previous versions, and network interface card (NIC), storage devices and peripheral device detection had been vastly improved.

The baseline hardware platform for NetWare 5 is now a Pentium-based server and 64M of RAM, and a 500M SYS volume. You will need at least a Pentium 200 and 128M of RAM to be capable of running the new graphical Console1 server-based GUI environment.

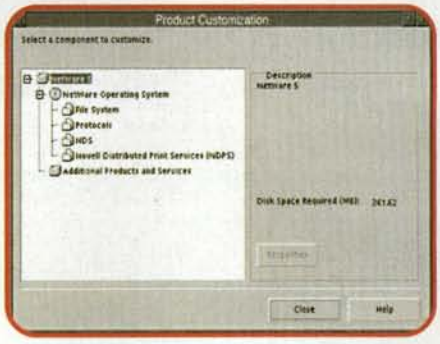
The initial installation stage is still text based, but after detection of NICs and storage devices, and the creation of the initial NetWare partition and SYS volume, the Install Wizard guides the user through the rest of the installation procedure. During our initial installation the two NICs were correctly identified, but we had to choose the correct fast SCSI host bus adapter from a list.

The wizard guides you through setting up the server name, slicing up remaining disk space, enabling IPX and IP protocols, creating the NDS tree and contexts, time zones and time sychronisation, server type, licensing and customisation. If multiple processors (up to 32) are detected during the installation then SMP support is automatically loaded.

NLMs and applications still need to be written to take advantage of the multiprocessor platform. A series of the core NetWare services are now multithreaded and will take advantage of the multiprocessing and other capabilities of NetWare 5's new kernel, such as abend recovery, the Media Manager, thread prioritisation and the Virtual Memory Manager. All modules that worked under NetWare 4.11's NLM-based SMP will also work without modification with NetWare 5.

Virtual memory is another new feature, allowing server applications and NLMs to be swapped in and out of memory to disk. A default 2M swapfile is created in the root of the SYS volume and swapfiles can be placed on multiple volumes for better performance, as NetWare will stripe them automatically. The swapfile will grow and shrink dynamically to meet requirements and can be manually set to minimum and maximum sizes.

Upon installation, you can chose between an IP or IPX-only environment, or a mix of both to support legacy NetWare 3.xx and 4.xx server networks. There also is an IPX compatibility mode available for applications that make direct IPX calls so that they may run over IP.



Additionally, a newly defined IETF Protocol, SLP (Service Location Protocol — RFC 2165, used for the discovery of network services) is implemented in NetWare 5 to discover infrastructure services such as NDS, DNS and DHCP servers and to encapsulate SAP broadcasts when running in IPX compatibility mode. Our initial look indicated that IPX performance is on par with previous releases and there was no noticeable performance degradation during IP-only operation.

Novell NetWare 5

Distributor	Novell
Phone	1800 812 959
Online	http://www.novell.com.au/
Price	$2,045 (for five users)
In short	A very significant upgrade, not to mention timely.

If your new NetWare 5 server is to be installed into an existing NetWare 4.10 or 4.11 environment, then planning will become critical to the success of the installation. Firstly, all existing 4.xx servers must have NDS upgraded to the latest version, as there have been some subtle changes in NDS support on NetWare 5, including the inclusion of specific NDS Access Control List attributes. The attributes can now be inherited down through the NDS tree but will be masked by any pre-NetWare 5 server not running the latest Directory Services.

As NetWare 5 defaults to a pure IP-only installation, installing into an existing NDS tree with NetWare 4.xx servers will make your new server invisible to the rest of the network. In this case both IP and IPX must be loaded onto your NetWare 5 server, or it can be configured in IPX compatibility mode, and can function as a gateway between IP and IPX-based NetWare servers by encapsulating IPX packets in UDP packets for transport from the IP to IPX networks.

Some of the biggest improvements to NetWare 5 come in the administration consoles, including a new Java console for client-independent administration.

The new server-based Java GUI that is used during the installation allows you to launch Java programs and applets and is pre-configured with some utilities including Console1. This new GUI allows access to some of the management functions of

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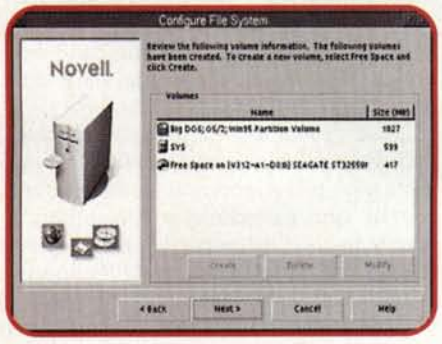
the server (it will also run on a browser at a workstation). It allows you to modify and browse the NDS tree, but works with only four NDS object types (user, group, organisation and organisational unit). This release does not have all the features of the workstation-based Nwadmin utility for management of all NDS objects and their properties.

There have been some other changes to the server-based utilities; the Servman functions are now accessible from the Monitor program and also from the Java GUI. To gain access to the server start-up files such as the AUTOEXC and STARTUP.NCF files and for reconfiguration of volumes, disk and NIC drivers, the install program has been replaced by Nwconfig.

NetWare 5 also ships with the ZENworks Starter Pack that allows desktop management, application distribution and management and workstation administration including policy management, utilising NDS for the distribution of profiles and applications through the network.

In conjunction with the Client 32 for Microsoft Windows 3.11/95/98 and NT, ZENworks reduces application installation times and support costs. We installed Client 32 on Windows NT and found it easy to select IP, IP and IPX and IPX compatibility modes from the control panel for client configuration.



A number of other applications have also been bundled in with the core NetWare apps, including Netscape FastTrack Server, LDAP Services for NDS, and a new JVM (Java virtual machine) for server-side Java applications.

Also bundled are OracleWare for NetWare (a fiver-user version), Novell Storage Services (which supports file systems up to 8T in size), Novell Distributed Print Services (for bi-directional communication between clients and printers) and Novell Public Key Infrastructure Services.

So, will this new offering from Novell be enough to launch Novell back into the premier position as king of the network operating systems?

A great deal will depend on the level of support that Novell gains for its application development environment based around its Java server. The current lack of server-based applications will hold back NetWare from presenting itself as an application server platform.

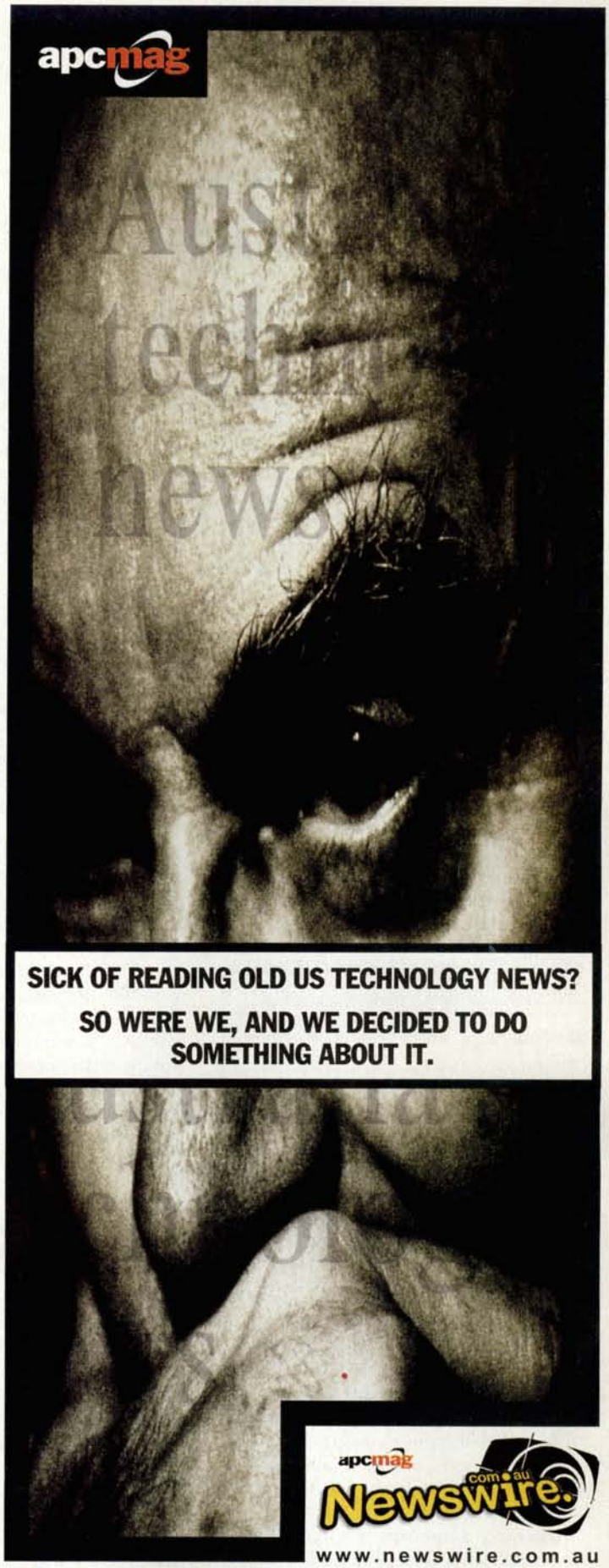
New features such as native IP support, ZENworks for complete centralised management of client platforms and applications and integrated DNS and DHCP management offer enterprise networks reduced support and maintenance costs.

The new Java-based GUI offers only limited management features and requires a significant amount of RAM to run at an acceptable level of performance.

The continuance of NDS as the distributed repository for all network services including DNS, DHCP, NDPS, LDAP Version 3 and Novell Storage services will allow Novell to retain its lead in the directory service market.

Unfortunately, the lack of standby or hot failover server support means that enterprises must look to third-party alternatives until Novell's High Availability Server for NetWare ships in 1999.

Greg Lowe



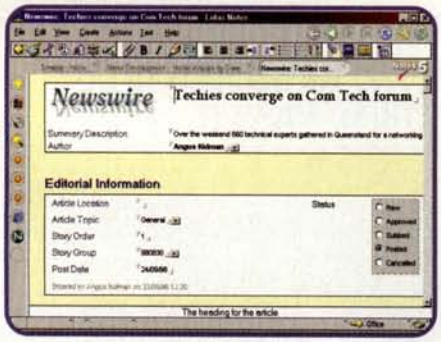
AUSTRALIA'S TECHNOLOGY NEWS

The latest update to Lotus' popular groupware promises a lot. Does it deliver?

Lotus Notes 5.0

Lotus Notes has proven to be a powerful and flexible tool for organisations that require advanced groupware connectivity. Notes combines the power of email and messaging services with database connectivity to provide a complete and powerful business collaboration solution. And, with the advent of the Domino server, exporting information from Domino databases to the Web became easy work.

A lot is expected of Notes 5.0, and it is likely that Lotus will deliver. For the most part, the existing Notes family of products is very complete and powerful, and most Notes shops are content with the functionality. The majority of problems with Notes are implementation details, such as the lack of multithreading in the client, along with a some weird Notes quirks. Notes 5.0 promises to address these issues, offer a better-looking environment, and provide tighter integration with the Domino server. Although the beta products we received were still fairly fragile in many respects, they do show great promise for the forthcoming release.



Notes 5.0 Client

The most obvious change in Notes 5.0 Client is a much-needed facelift. Notes is renowned for having a less-than-intuitive interface, and Notes 5.0 attempts to address this by capitalising on the popularity of Web interfaces. In 5.0, the tabbed workspace is gone, and in its place is a single frame from which databases are launched and viewed.

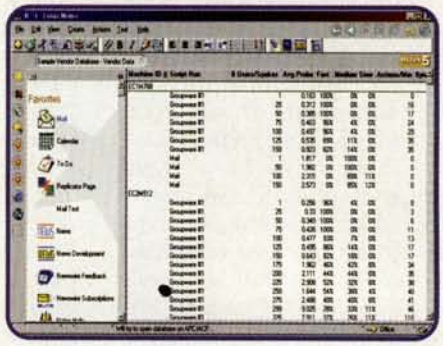
Opening databases is accomplished via a single-click on a bookmark. Pressing a 'bookmark button' will present a slide-out panel containing a series of links to various databases. The bookmark buttons serve to categorise bookmarks into several groupings, such as favourites, create, Netscape and IE links and any number of custom groups. While this feature is much slicker than the previous versions, the icons on the button bar are less intuitive, at least initially, than in previous versions. Once you are accustomed to the organisation of the bookmarks, however, the button bar is still an improvement. The version we reviewed is still an early beta and proved somewhat difficult to use, but Lotus has promised to improve upon this feature before the final version ships.

Another welcome improvement is the ability to navigate between opened documents with a single button click. In Notes 5.0, opening a document creates a tab button in the pane just above the document. To switch back to another document, you simply click on the first document's tab. There is also an 'X' in the corner for closing a document, and the tab entries can be dragged onto the bookmark bar to create a new bookmark entry.

Also new in Notes 5.0 is a series of 'Universal Navigation Buttons', which provide Web-like navigation in documents. Forward and back buttons make it easy to navigate through documents, and a stop button halts Internet activity. There are also buttons to refresh the current screen, search the current page or view, and to open a URL.

The Notes email client will be enhanced to include better support for standard mail protocols as well. Support for the POP3, IMAP and MIME protocols will be included, and users will be able to use the Notes email client to read emails from remote mail servers. Further, Notes email will also be accessible by non-Notes mail clients through the standard mail protocols.

The final component of the Notes client, the Notes Calendar, will offer slightly enhanced functionality as well. Included in Notes 5.0 will be a group calendar view, where users can view the schedules and available time of colleagues. Printing options have been modified to include various types of output, and options will exist to print specified time intervals. Several other minor modifications have been promised, although none of the enhancements are likely to impress existing users who frown upon the calendaring functions.



Many of the features promised for Notes 5.0 were either not present or disabled in the early beta we received. Chief among these is the Headlines page, which presents a page of user-customisable data. This page can include filtered email, information gathered from Web pages, and a listing of the day's appointments — à la Outlook 98's Today view. This promises to be a useful and powerful addition to the package. Possibly the most anticipated feature, at least at *APC*, is true multithreading in the client (so you can do something else while a database is loading or searching). Unfortunately, our beta version still froze while databases were opening, and was unable to redraw the screen, preventing us from doing anything else.

Missing features from the mail client promised in 5.0 include the ability to automatically spell check mail before sending. Another anticipated feature is the ability to specify the text delimiter for email replies. Finally, the Notes mail client will also support signature files for email messages.

Despite the changes to the appearance, the client still feels like the old Notes versions. Current Notes users will have little trouble making the transition to the new release, and first-time users should have little difficulty finding their way around.

Notes 5.0 Designer

One of the most prevalent design goals in Notes 5.0 is better support for Web application development. Lotus Domino, the Notes Web server, was introduced to the

Canon's patented new LIDE technology helps these new scanners

break the price/quality barrier.

Reinvent is the most over used word in the computer business. But this time it's true. Canon has just reinvented scanners.

And not a little bit, but completely.

Introducing LIDE.™ Using a new, patented technology called LIDE (LED Indirect Exposure), we have fundamentally changed the way scanners work, and their price/performance ratio.

LIDE eliminates the need for costly, complex optical mirrors in image acquisition, while it maintains superior image quality and colour clarity.

Easy to use. At the same time, LIDE allowed us to design a smaller, sleeker scanner with an exceptional combination of beginner and expert controls, and with easy to connect (daisy chain) parallel port connections for Windows® 95/98 and NT 4.0.

The new CanoScan™ FB 320P and FB 620P offer a choice of 300 or 600 dpi optical resolution, plus enhanced resolution up to 2400 dpi* and 30-bit colour acquisition as standard.

Full software suite. Both come with everything needed to begin scanning immediately. The CanoCraft CS-P software works for both stand-alone image acquisition, and as a TWAIN driver for other applications. It features new, easier to use controls, and advanced controls for colour matching and image definition. Also included are PhotoExpress for image editing and OmniPage LE for OCR, a CD-ROM with full tutorial and user's manual, a parallel cable and power supply.

LIDE LED Indirect Exposure

Canon Customer Care. The FB 320P/620P scanners feature a one-year warranty upgradeable to three years for minimal cost, and are backed by unlimited hot-line support.

The new CanoScan FB 320P and FB 620P. You can see they are different at first glance. To learn more call 1 800 021 167.

Photo Realism™

FB 320P – $229RRP and FB 620P – $299RRP

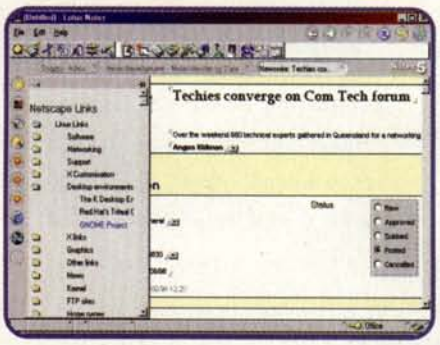
Canon

Price shown is the recommended retail price including tax. Canon Australia Pty Ltd ACN 005 002 951. *Enhanced resolution dependant on driver and software used. Canon and the Canon logo are registered trademarks and PhotoRealism, Canoscan and LIDE are trademarks of Canon Inc. Windows is a trademark of Microsoft Corp. in the U.S. and other countries. All other trademarks are the property of their respective owners. Canon reserves the right to change specifications without notice. CS5677

Notes family to Web-enable Notes databases. However, Domino was very much an add-on component, and many standard Notes interfaces, such as Notes views, did not lend themselves well to Web output. The utility of Domino could not be refuted, but the merging of HTML content for the Web and Notes-based development proved to be tedious. Notes Designer 5.0 is set to change this by offering an enhanced IDE with better support for both Web and Notes targets.

Notes Designer 5.0 will introduce JavaScript into the family of supported development languages. JavaScript can be used on forms as the basis for actions (either in Hotspots or in event handlers), and these actions will automatically be supported in the Notes environment and on the Web. The designer interface facilitates the creation of JavaScript actions by presenting an object browser in the lower left-hand corner of the IDE. After selecting a form element and choosing JavaScript as the formula language, a list of JavaScript 1.2 event handlers is presented. Code for a specific event handler can then be entered in the Design Pane.

Notes Designer will also ship with a frameset designer to aid in the process of creating frames-based Web sites. Creating framesets is a straightforward process, involving selecting the Create New Frameset option, and then selecting the layout for the frames. Frames can then be split both vertically and horizontally, and sizing can



be adjusted via the info tab. Users of the popular FrontPage program will have no trouble adapting to the new design.

Notes 5.0 will add support for the HTML 4.0 standard, allowing developers to define classes and styles for individual elements. And, to help overcome the inherent limitations of HTML, Notes 5.0 will ship with three applets for displaying views, rich text fields and an outline control for navigating a Web site. Notes 5.0 will also include enhanced support for table creation and design. Individual cells now support gradient backgrounds, and drop-shadow effects can be enabled on tables.

Notes Domino 5.0

The final member of the Notes family, the Domino server, has also received much attention. Large companies needing a more robust serving environment will perhaps be provided with the most compelling reasons to upgrade. In the 5.0 release, the Domino server line is divided into three separate components: the Domino Mail Server, the Domino Application Server and the Domino Enterprise Server.

The Domino Administrator, the user interface for administration tasks, now sports many of the same design enhancements as the 5.0 client. More importantly, however, administrators will have the ability to configure user settings and preferences from a central location. The Administrator sports a tabbed interface and will provide immediate access to directory services management, database information (such as templates and replication settings), server information and console operation, messaging service configuration and management, replication management, and configuration settings for clustering and Web serving.

One of the main focuses for the Domino 5.0 server is support for Directory services via the LDAP protocol. Domino 5.0 will mark the end of the Public Name and Address book, replaced by the new Domino Directory. With LDAP support, replicating and synchronising directory services across heterogeneous server environments will be fully supported. Domino 5.0 will also include the Directory Catalog, a compressed database for storing and retrieving user information. The Directory Catalog can be easily replicated for mobile users who need offline access to employee information.

Scalability and reliability are also design goals of the 5.0 release. High-availability clusters and load balancing options have been extended to include Web serving via the Domino Enterprise server and the Internet Cluster Manager (ICM). For NT shops, clustering solutions will also integrate with Microsoft Cluster Server to ease the administration burden. Along the lines of high-availability servers, auto-restart options for failed servers will also include the options of delaying restart (for failure analysis) and fast restart for immediate failure recovery. Finally, Lotus has spent much effort improving Notes' scalability, and now claims that Domino can support up to 1 million users.

As with the rest of the Notes line of products, most of the enhancements are more a matter of removing some earlier limitations than adding new functionality. For example, the 5.0 release of Domino bids a not-so-fond farewell to the 4G size limit on databases. In its place is a 32G limit, which should offer much more flexibility. For Unix-based Domino clients, telnet access to the server will also be supported. And for NT-based shops, Domino now supports the use of Microsoft's IIS server for HTTP serving capabilities. Finally, accessing back-end databases will be simplified with the additional ability to map Notes fields directly to relational database fields, without needing to store the information in a Notes database first.

Notes 5.0 will not offer the same obvious increase in functionality that the 4.0 to 4.5 upgrade provided. However, if all the promised features are delivered, and the little bugglets are squashed, 5.0 will be a welcome relief to any Notes shop.

Notes has always been a powerful solution, but it has also contained a number of minor annoyances that only become apparent after extended use. Notes 5.0 will address many of these issues (lack of multithreading, database size limitations, and so forth), and provide a better environment for use and development. Although there will be much added functionality, the rethinking of the application might very well be the most compelling reason to upgrade.

Travis Simon

Lotus Notes 5.0

Distributor	Lotus
Phone	(02) 9350 7700
Online	http://www.lotus.com/
Price	Not yet available
In short	With a classy new look and extended feature set, Notes 5.0 promises to be a compelling upgrade.

It is no mean feat to make Australia's most popular printer for home and small offices better than ever. But that's just what we've done with the new BJC™-255SP.

Use 75% less ink. Super Economy mode reduces ink consumption by 75% compared to Standard mode, and works for both black and white and colour. Combined with a high capacity, black ink cartridge, it can print up to 2400 pages in black and white, and up to 600 in colour using standard inks.* That's anywhere from two to five times the output of any direct competitor!

Fast B&W plus photo quality printing. Then, there is a choice of high-speed B&W, or three colour print modes – Normal, Fine and Photo. Photo mode emphasises highlights and contrasts, and improves half-tones by producing a richer process black.

Brilliant colour, super economy, optional PhotoRealism, improved Internet printing,

all for just $199.

Optional PhotoRealism.™ To this Canon adds the option of PhotoRealism inks, for photographic reproduction approaching silver halide quality. By layering inks in up to four densities, it produces up to four times the colour combinations of conventional CMY printers, for smoother colour gradations and more accurate colours in skin tones and other light shades.

Better Internet images. Image Optimisation takes low resolution Internet images (typically 72 dpi), and prints them at the highest resolution supported by the printer to reduce jagged edges and pixelisation.

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by Customer Care hot-line support. Drivers are available for Windows® 3.1x/95 and Windows NT.

For all this, there's one thing we haven't changed, the price. It's still a low, low $199 RRP. For more information call 1 800 021 167.

Photo Realism™

BJC-255SP colour Bubble Jet™ printer – $199 RRP

Canon

* Based on 5% page coverage, Super Economy not available with PhotoRealism inks. Price shown is the recommended retail price including tax. Canon and the Canon logo are registered trademarks and BJC, Bubble Jet and PhotoRealism are trademarks of Canon Inc. Windows is a trademark of Microsoft Corp. in the U.S. and other countries. Canon Australia Pty Ltd ACN 005 002 951

CS/5263

Compaq Armada 6500 & Dell Inspiron 7000

Ever since Digital merged with Compaq earlier this year, we've been wondering whether Compaq would abandon its Armada range in favour of Digital's superior HiNote series, or combine the features of both ranges.

The Armada 6500 is Compaq's first attempt at integrating the design and technology from Digital's HiNote Ultra 2000. Compaq has succeeded in some areas, but in others needs to do a little more work.

The notebook features Intel's new Pentium II 300MHz processor and a sharp 14.1in display. Its slim 3.3cm case packs in a 6.4G hard disk drive, 56K modem, and built-in 10/100 Ethernet. A carry weight of just under 3kg is more than acceptable. A docking station with built-in CD-ROM drive, speakers, ports and external volume control is available.

On the performance front, it did not disappoint. Running Windows 95, the Armada 6500 returned a Business Winstone 98 result of 20.1, slightly higher than the 17.7 result the Compaq Presario 1650 scored (see *APC* September, page 38).

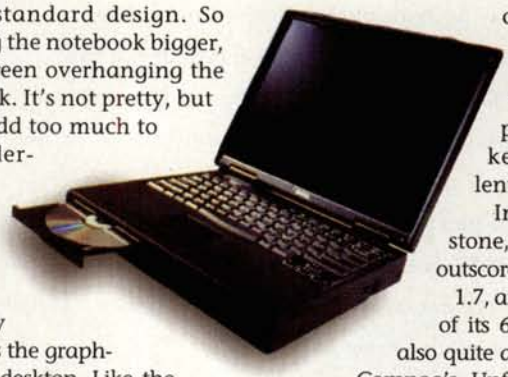
Its 4M of SGRAM motored the ATI Rage LT Pro AGP graphics controller to fantastic results in both the Business and High-End Graphics WinMark tests; it scored 130 and 158.3, respectively. The battery lasted a solid three hours and 17 minutes under Ziff-Davis' BatteryMark.

But performance is one thing, and usability is another — there were a number of features we didn't like. Our unit had a very temperamental glidepad; its pointer inexplicably darted across the screen, and often became stuck. The click buttons beneath the glidepad required intentional force to respond. But the worst feature of all was the keyboard. The buttons are placed far too closely together; typing proved difficult, as the keys almost meld into one large button.

Overall, it's an impressive performer, but for almost 10 grand, you'd want a far more usable notebook than this.

Compaq, of course, is not the only vendor to be releasing a notebook based on the latest Intel 300MHz Pentium II processor. This month, we also had a look at the Dell Inspiron 7000 D300LT. Its excellent 15in LCD makes it notable among 300MHz notebooks.

The size of the screen has obviously caused Dell some headaches, as it is too big to fit into a standard design. So rather than making the notebook bigger, Dell has left the screen overhanging the base of the notebook. It's not pretty, but at least it doesn't add too much to its already considerable weight and bulk.



Apart from the large screen, the Dell is a very solid notebook, and finally offers notebook users the graphics capabilities of a desktop. Like the Compaq, it uses the AGP bus (new to notebooks) and incorporates an ATI Rage LT Pro with 4M, giving it fine 2D and 3D capabilities. As a result, its Graphics WinBench scores were as impressive as those of the Compaq. As an added bonus, the Dell also supports TV-out.

The floppy and CD-ROM drive both occupy the system simultaneously, and the glidepad was only slightly painful to use. The keyboard is excellent.

In Ziff-Davis' Winstone, the Dell actually outscored the Compaq by 1.7, and the performance of its 6.4G hard disk was also quite a bit better than the Compaq's. Unfortunately, for reasons unknown to us, the Dell could not complete our BatteryMark tests.

The Dell is a real power-user's dream. It's not terribly elegant, but it definitely has the best you can get in a notebook at the moment — and it's quite a bit cheaper than Compaq's Armada.

Roulla Yiacoumi and Nathan Taylor

Specifications and benchmark results

	Compaq Armada 6500	Dell Inspiron 7000 D300LT
Distributor	Compaq	Dell
Phone	1300 368 369	1300 303 263
Online	http://www.compaq.com.au/	http://www.dell.com.au/
Price	$9,495	$6,634
Processor	Intel Mobile Pentium II 300MHz	Intel Mobile Pentium II 300MHz
Secondary Cache	512K	512K
RAM	64M SDRAM	64M SDRAM
Hard disk drive	6.4G IDE	6.4G IDE
Hard disk file system	FAT32	FAT32
Video bus type	AGP	AGP
Video RAM	4M SGRAM	4M SGRAM
Video controller chip	ATI Rage LT Pro	ATI Rage LT Pro
Pointer device	Glidepad	Glidepad
Dimensions (cm)(H by W by D)	3.5 by 30.5 by 24.7	6.35 by 32.77 by 26.67
Weight	2.9kg	4kg
PC Card slots	2 Type II or 1 Type III	2 Type II or 1 Type III
CD-ROM drive	24x Atapi	24x Atapi
Sound chip	In-Docking station	ESS Technology Maestro-2
Modem	56K	56K
Network interface card	10/100 Ethernet	N/A
Display	14.1in TFT	15in TFT
Maximum internal resolution	1,024 by 768	1,024 by 768
Operating system	Windows 95	Windows 98
Warranty terms	3 years limited	1 year
BENCHMARK RESULTS		
Business Winstone 98	20.1	21.8
CD-ROM WinMark 98 (K per second)	1,063.3	945.3
CPUMark32	750	744
Business Disk WinMark 98 (K per second)	950.7	1,106.7
High-End Disk WinMark 98 (K per second)	2,426.7	3,100
Business Graphics WinMark 98	130	132.7
High-End Graphics WinMark 98	158.3	158
BatteryMark (hours:minutes)	3:17	Did not complete

1. The product used in these tests is the shipping version available to the public at the time of publication unless otherwise stated.
2. Winstone, Winbench and associated products are registered trademarks of the Ziff-Davis Publishing Company.
3. These tests were performed without independent verification by Ziff-Davis Publishing Company.
4. To test the battery we had APM enabled on the notebook. All power-saving features were disabled.
5. Notebooks require an internal resolution of 1,024 by 768 to run these tests.
6. Winstone and WinBench were run at 16-bit colour depth.

Better colour, Super Economy, fast blacks, PhotoRealism and optional scanner,

the BJC-4310SP does it all.

It can cut ink consumption by 75%, be used as a scanner, improve printed images down-loaded from the Internet, or even print banners. And this is in addition to better colour for plain paper, PhotoRealism inks for the gold standard in photo quality printing, plus super fast B&W!

Better operating economy. Super Economy mode reduces ink consumption by 75% compared to Standard mode, and works in both black and white and colour. It can print up to 3600 pages in black and white, and up to 400 in colour[1].

Better on plain paper. Another feature is Canon's Drop Modulation Technology with dual drop sizes for smoother colour gradations. It is designed to produce better looking colour on plain paper, which also helps keep operating costs down.

The PhotoRealism gold standard. When quality is most important, there is the option of Canon PhotoRealism inks. They vary the saturation per pixel so that a single dot could have 0%, 33%, 67% or 100%. This produces up to five times as many colour combinations as conventional CMYK inks, with better half-tones and almost no visible grain, even in areas of low colour density.

Super Economy in colour and B&W

High speed blacks. A high-speed black ink cartridge with 128 print nozzles is included with your purchase. It is capable of speeds up to 510 characters per second (4.5PPM)[2].

It's even a scanner. The optional IS-22 scan head allows you to turn your printer into a colour scanner in seconds. It scans colour images up to 360 dpi and offers high speed B&W scanning for fax, OCR and copying functions[3].

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by unlimited hot-line support.

The BJC™-4310SP. Everything you could ask for in a printer, and a little more. For more information call us on 1800 021 167.

Photo Realism™

BJC-4310SP colour Bubble Jet™ printer – $299[RRP]

Canon

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Users of Illustrator 7 will be pleasantly surprised by this upgrade.

Adobe Illustrator 8

Adobe has done a lot of good work with this latest version of Illustrator. It is more time efficient and user-friendly, making the upgrade from Illustrator 7 to Illustrator 8 well worthwhile.

For Photoshop users, one of the major advantages of Illustrator 7 has been its similar interface and keyboard shortcuts. In Illustrator 8, Adobe has continued to leverage Photoshop's market lead and the program now incorporates Photoshop features such as the Actions Palette, the Navigator Palette and the improved Layers Palette.

The Actions Palette gives you the ability to record frequently used actions, and link them to hotkeys. This is a godsend if you are performing repetitive actions — it allows you to hit one key instead of repeating the many steps that may be used for applying fills and strokes, gradients, swatches, text attributes and object transformations, such as blurring and drop shadows.

Another time-saving feature is the Navigator Palette, which allows you to quickly zoom in and out of complex illustrations to fixed positions, and proves useful for moving around in large illustrations. Users can see an edited object in a larger context without having to scroll or wait for the screen to redraw several times, and can specify a precise zoom of up to 6,400%.

The Layers Palette works the same way it did in Illustrator 7, except you can now preserve layers when saving in Illustrator, using a Photoshop file format. This allows you to make up graphics in Illustrator, and then open up Photoshop to manipulate these layers.

Adobe also appears to have finally taken notice of the popularity of Corel's clip art range, and now incorporates some of its own. New libraries have been set up within Illustrator 8 which include clip art, tapered strokes and arrows, and brushes (similar to Photoshop's selection) that can create charcoal and oil paint effects.

The Scatter Brush libraries include leaves, flowers, stars, insects, food, and objects such as balloons, paper clips and drawing pins. The Scatter Brush tool has been introduced to save time duplicating and pasting multiple images around artwork. For example, to create a line of footprints, you would no longer have to duplicate each foot, and paste one foot in front of the other. Instead, you can make a path, apply the Scatter Brush Tool, and the feet would be automatically placed along that path. Using the randomisation options, you can control the size, spacing, and relative dispersion in order to give these paths a free-form look and feel.

The Pencil Tool has also had an upgrade. When an object needs editing, you no longer have to add or subtract anchor points, fight with the direction tool, and redraw and delete what wasn't wanted. To tweak a shape in Illustrator 8, you simply start to redraw any part of the selected path, and the path is instantly adjusted.

To complement the Pencil tool, the Smooth Tool helps you to draw smoother paths. Unwanted bumps and wrinkles in a path can be removed by dragging the tool over the path. This tool is especially useful for drawing complex illustrations or tracing logos.

Complex illustrations can be created more easily using a new feature called Smart Guides, which helps capture angles of objects more accurately. These guides help users move, align and transform paths. Additionally, advancements in the Swatches and Color Palettes, the Eyedropper and Paint Bucket tools, and the introduction to the Gradient Mesh tool all assist with colour maintenance.

When a file has been imported, the Swatches Palette is automatically updated to include that file's particular colours. This means exact colours are available if you need to apply them somewhere else in the illustration, or on another object.

The Fill and Stroke controls are now included in the Colour Palette, which makes changing colours or gradients even easier. And for printing purposes, you can now define a registration colour in the Color Palette that automatically prints on all separations. This is handy for crop marks and other printing marks necessary for printing on plates.

As well as transferring colours, the updates made to the Eyedropper and Paint Bucket tools now apply to transferring text formats too. Text attributes can be sampled with the Eyedropper tool and applied to another text box using the Paint Bucket tool. These attributes can vary the font size and type, tracking and kerning, and highlights such as italicising. This is very useful if you have a number of differently formatted text boxes on your page which need to be changed to suit just one layout.

The Gradient Mesh tool is an updated mix of the Blend and Gradient tools in Illustrator 7. Multiple colours can be blended in different directions and to create airbrush and watercolour effects. It is used similarly to the Blend tool in Illustrator 7, where you click on separate anchor points. However, it provides more control over the direction, shape and combination of colours used, because it automatically updates the work as the user adds or subtracts anchor points. The tool expands the range of shading, lighting and tonal transitions, which until now have been the domain of Photoshop.

This package offers solid integration with Windows 98 and Mac OS 8. It works well with all Adobe products, as well as other software, including Microsoft Office, Autodesk AutoCAD, CorelDRAW and Macromedia Freehand.

Illustrator 7 was a big jump from Illustrator 4, and Illustrator 8 has proved to be one giant leap. The new tools and features, and improvements to the existing ones, make this package a great upgrade.

Ashlea Miller

Adobe Illustrator 8

Distributor	Adobe
Phone	1800 065 628
Online	http://www.adobe.com/
Price	$895; upgrade $249
In short	A big step up from Illustrator 7, and an excellent companion for Photoshop.

Canon BJC-80
$399RRP

Canon BJC-50
$699RRP

Advanced colour, cable-less communications, optional scanner plus two sizes that are

Small and smaller!

Canon has a wonderfully new idea for people that need a portable printer. A choice.

On the small side there is the BJC™-80. It is a fraction of the size of a briefcase. Yet, with its in-built sheet feeder and power adaptor included as standard, it is designed for people who have to produce high volume output from a very small printer.

Drop Modulation Technology.

Conversely, if size is critical, there is the brand new BJC-50 with in-built battery. It's not just small, at approximately half the size of the BJC-80 it's absolutely tiny.

Equally impressive, their performance is as big as their size is small.

Using Canon's advanced Drop Modulation Technology™ you can print everything from colour charts, to high quality photographs. Or, in seconds you can convert to extra high-speed black and white for finished business documents using the dedicated black cartridge with 128 print nozzles!

The BJC-80 fits in approximately half the space of a briefcase. The BJC-50 is approaching 50% smaller still.

Optional colour scanner.

For greater portability, both models include an infra-red port for totally cable-less communications with any suitably equipped Windows® 95 notebook or PC.

And, if you really need the functionality of an office in the space of a briefcase, both models will accept an optional colour scanner head in place of the print head. It takes only seconds to change the heads. You can then use the scanner head to acquire colour images, or for fax and OCR functions.*

Cable-less communication.

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by Customer Care hot-line support. Drivers are available for DOS, Windows 3.1x/95 and Windows NT.

If you need help choosing between small, and smaller, give us a call on 1 800 021 167.

Canon portable colour Bubble Jet™ printers

Canon

*Scanner-head works with Windows 95 only. Fax and OCR software not included with purchase. Canon and the Canon logo are registered trademarks and Drop Modulation Technology, Bubble Jet and BJC are trademarks of Canon Inc. Windows 95 is a trademark of Microsoft Corp. in the U.S. and other countries. Canon Australia Pty Ltd ACN 005 002 951. Prices shown are recommended retail prices including tax.

CS/5420

The Gadget File

• Now that USB products are starting to trickle onto the market, the only problem is that many would-be users don't have the right connections on their PCs. At a recent technology showcase, Philips displayed a retro-fit internal PCI card which has a built-in USB controller and hub. Pricing was not available for the device, but this would be an ideal way for users to take advantage of the low cost and stackability of USB devices without having to fork out for a completely new hardware platform.

• Increasing numbers of chip makers seem to be trying to edge Intel out of the number one spot by offering alternatives. CPU company IDT (maker of the low-cost WinChip) is still tapping into the chip upgrade and cheap OEM motherboard market with a new range of 200, 225 and 240MHz Socket 7-compatible chips. All are fully compatible with single-voltage subsystems, and are aimed at offering solid Winstone performance without all the heavyweight capability (and power consumption) that Intel builds in. This makes them ideal for first-time-buyer SOHO machines, says IDT. IBM is also pursuing an alternative strategy with its prototype Media Processor chip. IBM claims the new 128-bit chip breaks new ground with a 'partitioned' data path, so up to eight separate 16-bit operations can be worked on simultaneously. This means the chip can always work at 100% capacity no matter what the task, unlike Intel's current series.

• On the imaging front it appears most digital camera makers are working full blast on CMOS (complimentary metal oxide semiconductor) image sensors to replace the power-hungry CCD (charge coupled devices) used in the majority of today's digital devices. Already Toshiba is using one in its Japanese market cameras, but it seems image tonal range and contrast are yet to be optimised for the CMOS sensors. However, with vastly improved battery life and image stability, watch out for CMOS sensors in the next year or so.

• New from Alcatel is the latest generation of GSM digital phones with initial glimmerings of microbrowser technology. The Alcatel One-Touch Com uses an icon-based, touch-screen interface for all its functions, including SMS (Short Message Service) and specialist push-feed service access. Alcatel says the next step is to build in WAP (Wireless Application Protocol) based technology that enables WDML (WAP DML) compliant pages on the Net to be accessed directly from the phone without requiring an OS, browser or ISP.

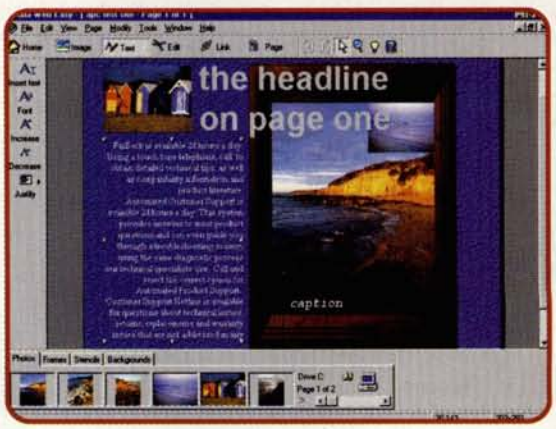
Jeremy Torr

Ixla Web Easy

Those more familiar with desktop publishing packages than HTML editors often find Web design complex and frustrating. Even with a so-called WYSIWYG Web editor, it's rare to be able to actually drag, drop and juggle elements of a page — usually the interface is more like a word processor than a DTP program, and design freedom is constrained by how the program wants to write its hypertext.

Web Easy, from Australian digital imaging software company Ixla (formerly ISR), is different — it allows the user to create HTML by dropping elements of a page into place. What's more, it performs miracles with automatically generated HTML, allowing the user total freedom to move anything anywhere on the page and compensating for changes on the fly. Whip together pages in a leading DTP package and run them through its HTML conversion filter, and you can expect the result to merely approximate the original. But in our tests, Web Easy relentlessly produced Web pages that were identical to what we intended.

Be warned, this is by no means a fully-fledged hypertext mark-up program; it lacks a few advanced features like a table editor and frames support, and you can't use it to edit raw HTML, so in drag-and-drop Web editing terms it isn't NetObjects Fusion. But it's much cheaper, it's faster, and it doubles as an image manipulation program: drop a picture on a page and you can resize or redimension it as you please, place a border around it, or sit other elements on top of it. Images can be imported from a scanner, digital camera or other source. When your page is finished and you export it to a Web server, GIFs are automatically generated from what you've arranged onscreen, and you can tell the program whether to aim for quality or small size in its image files.



Just as in a DTP package, text is treated in resizable, movable chunks. You can hold down the Shift key to retain the correct proportions when resizing, and 'send to back' or 'bring to front' items. The program automatically uses HTML tables to keep elements in position.

As is usual in today's Web editors, an FTP program is included to 'publish' the output to a server, and the program is focused on sites rather than individual pages — you save all output as a site, and the program links pages together based on your instructions.

Thanks to Ixla's background in digital imaging software, Web Easy has been designed with creative people in mind, not programmers. Visual tutorials and sample material help bring the user up to speed quite fast, but experimentation is the best way to pick up skills.

Some of the best HTML editors in the world are Australian, and Web Easy is a worthy addition to that list. I don't have any plans to uninstall it.

Simon Vandore

Ixla Web Easy

Distributor	Ixla
Phone	(03) 9803 1600
Online	http://www.ixla.com/
Price	$65
In short	If you just want to drag and drop a Web site together, this is exactly what you need.

Only Canon offers a way to acquire and print images in colour with a

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Canon has a unique solution to a question that has often plagued colour printer users. How do you get the image in, so you can output it to your Canon colour Bubble Jet™ printer?

Only from Canon. It is an optional scanner head that fits right into your printer, and it is available on several models for just $149.[RRP]

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Forum

We welcome commments and suggestions. Send correspondence to *APC* Readers' Say, PO Box 37, Sydney 1028; or by email to: APC@acp.com.au.
All correspondence becomes the property of *APC* and is subject to editing.

Sound advice

While I find your magazine a highly enlightening experience full of useful information, it often fails to take that extra step past simplicity, which can be frustrating. Not that complete technobabble is called for, but your readership are quite literate, understanding people who can deal with more than the simplest computing concepts. Why not expand that knowledge base a little? Even in reviews of equipment we often only see the standard mass-market devices — such as the 13 low-end graphics cards and 12 low-end soundcards from the October issue. Of course this is where the majority of customers are, but sometimes we want to see those $4,000 OpenGL cards, or the 16-channel soundcards. Add some variety, keep your readership informed and you will deserve the description of Australia's leading computer magazine.

Aaron Barker
Internet

Unsound detail

Your latest (October) edition is to be commended for rounding up such a great variety of soundcards for review. Everything is represented, from the high end to the el cheapo, and given a fair hearing. My complaint, though, is that you go to great lengths to explain 'how we tested' and explain in easy-to-understand terms signal-to-noise ratio and so on, but don't present the results. Only frequency response is presented in graphical format. Vital info such as signal-to-noise ratio is not presented for every card in an easy-to-compare way and the results of other measures don't appear at all. This seems like a glaring omission, particularly because this info isn't on the Web site either. Surely, if you have gone to the trouble of collating all this information, you could make it all available to the reader. I am left very frustrated that the main way to compare the sound quality of the cards is to weigh up your unavoidably subjective comments. Hard data is very scarce in your article.

John Glasson
Internet

Ed note: Some of the test results for the soundcard feature in our last issue were accidentally omitted. Additionally, the frequency response graphs on page 122 were not clearly marked as such. APC *apologises for any confusion this might have caused, and we have posted the full results along with the reviews on our Web site, at http://apcmag.com/reviews/9810/sound.htm. Each review has the card's frequency response graph embedded in it, and the other results appear with the specification table at the end of the feature.*

Linux lesson

Firstly I'd like to congratulate you on your mag. It's good to see an Australian publication that caters to more than just the Wintel platform.

There are a few points, however, that could be improved: 1) The Linux versions of Netscape on the CD-ROM. The versions of Netscape provided on the CD are incompatible with the Debian Netscape install scripts. The Netscape 4 Deb package expects to find a file with the name navigator-v406-export.x86-unknown-linux2.0.tar.gz in the /tmp directory. You have renamed the file to something that fits the DOS 8.3 format.

Perhaps you should ship a script that mv's the file to an appropriate name. Those of us who are comfortable with Linux will of course have no need for such a thing, but as you are exposing newbies to Linux, it would be considerate to let them use dselect to install Netscape cleanly.

2) Existence of other distributions. I accept that Red Hat is easier on the newbie than Debian or SuSE. But to promote Red Hat at the expense of other distributions, especially given Red Hat's rather poor showing in the security area (Red Hat 5.0 has the named root exploit bug, for example) is probably not the best move.

I suspect that either: a) *APC* is being paid by Red Hat to promote its product; b) Your 'Linux guru' has a very two-dimensional experience of the system; or c) You are accepting articles from anyone who can sound like they know what they're talking about. Of course, I could be wrong.

I understand that you have to take what you can get, and that your primary concern must be profitability, but there does seem to be a problem in this area.

3) Expertise of your Linux authors/editors. Promoting sendmail for home users as a preferred MTA is not a good thing IMHO. Smail, Exim or Qmail are all easier to configure for the newbie, and are much less likely to break security if misconfigured. Configuration of sendmail is deep black magic at the best of times.

I have to wonder about your authors in the Workshop column. I don't think that those of us who know the column will be buying the mag to learn the things discussed there, but it is an opportunity to help the newbie understand what is admittedly a rather arcane system.

Having said all that, I must admit that the primary reason I buy your mag is because it has some Linux content. I hope to see this trend continue — AFAIK you are a world leader in your promotion of Linux and programming in an area that is being dumbed down by much of the popular media.

John Foster
Internet

Competition winners

Many thanks to the hundreds of readers who completed our recent ISP Service & Reliability Survey 1998. Five lucky respondents have won a prize pack containing a Banksia Wave SP 56 modem, an Iomega Zip drive and a Canon FB310 scanner.

Our congratulations go to: Michelle Banfield of Kambah, ACT; Peter Calder of Orange, NSW; Paul Moorfoot of Belmont, Vic; Jeanette Carr of Devonport, Tas; and Steve Sargent of Ashmore, Qld.

Service & Reliability would like to thank Sirius Technologies (Banksia modems) and Iomega (Zip drives) for supplying the prizes.

A2

A3

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The Canon BJC-5500 can do something that no other printer can,

print more paper types.

A4

Envelopes

Overheads

Computer

broadened by the fact that the BJC-5500 is also an exceptional four-colour CMYK printer capable of producing text and graphic lines in resolutions up to 720 dpi.

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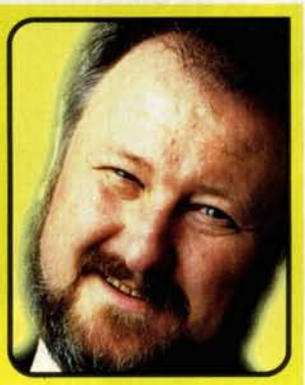
Election fairytales

This fairytale has no happy ending. There's just a glass slipper sitting abandoned in the middle of the information superhighway.

By Helen Dancer



Good-enough software

If you want me to be a beta tester then just say so, and charge me less for my software.

By Jeremy Horey

Was I dreaming? Did I lose contact with reality or did it really happen? It was like dropping a stone into a pool of water expecting to see ripples spreading out to the edges of the pool, only to see the stone sink, leaving no sign it was ever there.

Recently Microsoft admitted that there is a bug in its database product Access that can cause users to lose data. This bug affects Access 2, 97 and 98. It went even further: the flaw is in the Jet database engine which is also used in Visual Basic.

However, now it's as though the bug was never found. There's a report on the Microsoft Web site (http://support.microsoft.com/support/access/content/datachanges.asp), but that's the only reference made by Microsoft I can find. A week after the bug was found there are no new reports about the bug or what's being done to fix it. The press has gone silent.

There are reports of bugs all the time, and security bugs usually get the biggest coverage. Hacking and anti-hacking stories always get a reader response. But the Access bug was about data loss in a database product. If you can't trust a database to hold your data, the product is almost useless. I for one was concerned about the extent of the problem and wanted to know when Microsoft planned to issue a maintenance release to fix it.

ing when the press is filled with reports of the year 2000 bug detection and fixing efforts. The US Federal Government is spending $US5.4 billion to fix the Y2K problems. This is bug fixing on a scale to dwarf even Microsoft's efforts.

But should software consumers have to accept bugs? There's no doubt that software developers, and in particular the developers of shrink-wrapped software, deliver products with bugs in them. In fact, today it looks like they are delivering software with more bugs than ever.

There's even a name for this approach to building software. It is called 'good-enough software'. Good-enough software comes from the need to balance limited resources and limited time with functionality and bugs.

"As a mental abstraction, any intelligent customer — especially one who has survived in today's tumultuous business times — is aware of the need to make trade-offs and balance priorities. But customers are often naive about the details; for example, it may not occur to them that it should, they start by denying that there is any problem. If the pressure mounts and the evidence becomes unavoidable they eventually admit the problem and post something to their Web site.

In the meantime the programmers are busy working away on the next version of the software, adding more features in an effort to beat the competition and to keep the upgrade revenue flowing.

Again, there's nothing wrong with this, provided they are honest. When software is shipped it should contain a list of known bugs and companies should keep up-to-date lists on their Web sites of known bugs and workarounds for these.

The US Federal Government is spending $US5.4 billion on Y2K problems. This is bug fixing on a scale to dwarf even Microsoft's efforts.

I'm happy to accept a product with some bugs for $250 now rather than wait another year for the same product at $1,000 with no bugs. But I want the software developer to keep me informed about the bugs as they are uncovered, even if this costs me another $50.

If it is too painful for the developers to keep track of the bugs in their own soft-

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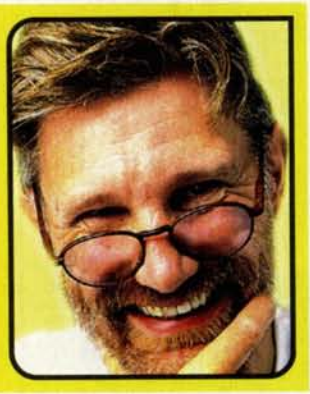

Mark my words: usability will prove to be the final workaround.

By Jeremy Torr

The other big Australian

This year sees the 75th anniversary of the opening of Telstra Research Labs (TRL), now based at Monash in Victoria. Over the past three-quarters of a century, the mighty PMG (Post Master General), then Telecom, now Telstra has pioneered a multitude of developments ranging across disciplines from health to communications. There have been the bionic ear, remote area satellite communications, and the use of optical fibre as a data exchange medium. Although the TRL is a difficult item to pin down on the balance sheet, there is no doubt it has contributed mightily towards the current quality of the telephone — and, more recently, digital data — networks we have at our disposal in Australia.

And before a mass of readers start decrying Telstra's woeful service, I would suggest they take a look at countries such as the US, the UK or Japan. Many of us just don't realise how lucky we are. But the point here is not to give Telstra a big pat on the back, but to look at how the giant has built both itself and the service it offers using a basis of cooperative research. Its success has not been based on self-protectionism and restrictive dealing. Admittedly, some of this, especially more recent developments in the mobile field, have been given a nudge by political interests, but the wide coverage and high standard we enjoy has been due to a commitment to providing a service first and making a big profit second. Even if it meant working closely with what might otherwise have been seen as competitors.

Compare this to the current situation in the PC world, in both hardware and software zones. Huge megalithic companies produce products designed primarily to give the impression that the quality and standard of service is increasing, but which are in fact mainly oriented at keeping those companies in positions of market domination. This leads to a market protected by sheer weight of numbers, producing a de facto standard to which all new users have to adhere because everyone else is already there. These megaliths stitch up cosy deals with subservient (read: less fiscally endowed) organisations, and by dint of pure marketing muscle manage to keep other, equally viable — and, more importantly, publicly useful — technologies out of the limelight. So we come to a situation where public perception is swayed as much by the weight of numbers as by best practice. This is light years away from those technicians labouring away in the TRL backrooms in the early 1960s, developing 2,400bps data transmission protocols for use on moon-landing transmissions. This valuable work led directly to the nationwide high-speed optical networks we now take for granted.

Telstra has a commitment to providing a service first and making a big profit second.

But the problem with megaliths is that they become unwieldy, and spend so much time guarding the family vault they forget that other people can come up with alternative solutions to problems. Surprise, surprise, that is just what is happening right now. Ask anyone in the street if they own a computer, and 15% will say yes. Ask anyone if they connect to the Net, and 5% will say yes. Ask anyone if they have a mobile phone, and anywhere up to 30% of people will say yes. Despite all the self-congratulation by computer companies about PC growth and Internet uptake, the big growth area is in mobile communications. Ericsson reckons over 200 million people will buy a mobile phone next year — in addition to the existing millions already out there. They will be buying them not because they have RISC chips, 32-bit operating systems and 100MHz buses. They will be buying them because they can use them easily and immediately. Because of this, companies like Nokia, Ericsson, Motorola and Psion have recognised that the central issue is not the technology, it's the service. So if they can offer mobile, accessible Internet voice and data access to an obviously keen public, they will be able to completely bypass the traditional computing megaliths.

And the interesting fact is that all these companies, who may be seen as competitors, are right now working together to produce a new operating system for mobile terminals. The new system is codenamed Symbian, and doesn't rely on Wintel standards, but is making up its own rules dedicated to one just thing: producing a workable, lightweight and accessible data system for users on the go. Symbian is designed to link directly into existing Net protocols to provide instant-on access to all the usual reference material on news, travel, monetary transactions and more, but more importantly, to integrate all those seamlessly with voice and video on any handset. The other very, very significant factor about the platform is that it is non-proprietary. Instead of being dictated by a few powerful, nationally-biased and totally profit-oriented companies, it is overseen by the GSM standards organisation, ETSI. This is made up of manufacturers, operators and service providers from over 40 countries, working in a spirit of mutual advantage and cooperation.

Telstra Research Labs is still here and collecting awards after 75 years. Will the Wintel monopolists still be in 2055?■

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- Integrated Ultra2/Wide and Ultra Wide SCSI Controllers
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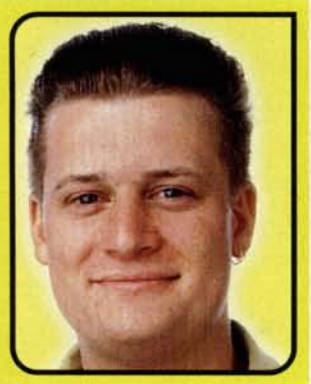

Riding on Telstra's curtails

Telstra thinks we wouldn't know how to use extra bandwidth. All it takes is a little imagination.

By Dan Tebbutt

What would you do with 2Mbps? Would you start launching RealVideo newsclips instead of scrolling despondently past video icons? Or would you grab MPEG-3 sound files and burn a CD containing your favourite prerelease tracks? Perhaps you'd take a look at the Louvre online, check out that scanned human anatomy or enrol in a Web-based masters at RMIT. You might even brave ecommerce and sell your breakthrough widgets to the world.

Sadly, for all but the idle rich, none of this is realistic on today's slow, unreliable Internet. And going by Telstra's current attitude, we are unlikely to lay our hands on serious bandwidth any time soon. Apparently Telstra believes we can just keep handing over bags of money and one day — when Telstra is good and ready — we might be granted access to a little more bandwidth.

Cynical suspicions were recently confirmed in black and white. John Rolland, the normally quite sensible general manager of Telstra Internet Services, came right out and said it.

"What are Mr and Mrs Smith going to do with 2Mbps to the home?" Rolland asked in *The Age* IT section on September 8. "The issue is not getting it there as soon as possible, but when the customer demands it."

Rolland outlined Telstra's three-pronged approach to providing bandwidth, using the existing Big Pond Cable hybrid fibre coax (HFC) network, newly installed digital subscriber line (DSL) technology, and satellite (for rural customers). "People are still obsessed with the underlying technology," he added. "With a country as big as ours you will never get plus-1Mbps bandwidth with a single solution."

Fair enough. What remains unsaid, however, is that Telstra has bandwidth to burn. An enormous number of backbone fibres remain unlit. ISDN is supposed to cover 97% of Australia, but only 73,000 lines have actually been installed, according to the Australian Communications Authority. Why are so few people taking advantage of faster local loop connections? In a word: price.

Outrageous tariffs continue to hold back ISDN, notwithstanding recent price drops. Connecting to Telstra's OnRamp service involves a $295 set-up fee, and you'll also need a $500-plus ISDN adapter to attach your PC to the network. Monthly line rentals are now down to $50, but that's still more than three times a standard phone line. But the real impost keeping ISDN beyond the reach of home and small business users is timed local calls. Data connections cost $1.91 per minute, voice calls even more. And that's before adding substantial ISP charges!

Telstra could take a leap of faith and unleash some cheap bandwidth.

Haughty Telstra has yet to understand that if ISDN charges were reasonable, people would buy it in spades. Blaming an alleged lack of demand only shows how blinded by conventional telco thinking the carrier remains.

There is another way. Instead of supercilious comments about our ability to use bandwidth, perhaps Telstra could take a leap of faith. Unleash some cheap bandwidth into the Australian online community. Encourage small businesses to seize the frictionless market. Help home users enjoy a rich Web experience. Make our schools the most wired on the planet. Then we'll really know if people can use bandwidth.

It's a question of marketing. Telstra is an outstanding technology organisation, but its promotional efforts generally fall way short of the mark. The telco should be encouraging consumers and businesses to imagine new ways to use bandwidth, not speaking down to us. California's Pacific Bell has run a wonderful campaign promoting the many weird and wacky things people do with the company's voice and data networks. Ads featured mud-wrestling support groups and cyberpunk grannies.

"How will you use it?" ask PacBell billboards and voice-overs. A comparable Telstra slogan might be: "You won't use it!"

Admittedly, fast network pipes into schools, small businesses and homes will sit idle for much of the day — but almost all phone lines experience long periods of inactivity. Even more expensive resources like trains and planes don't run non-stop. AT&T researcher Andrew Odlyzko (see page 67) argues data networks will never be used as efficiently as voice networks. "Efficiency in utilization of transmission lines or switches should not be the main criterion for evaluating how good a network is," he wrote in a recent paper. "The crucial question is how well customers' needs are satisfied."

Worrying about network underutilisation is like crying over sand dunes that are not converted into silicon chips. Fibre optics guru Professor David Payne argues the availability of bandwidth itself is what encourages innovation in network use. "What I contend is that it's the availability of bandwidth which allows all these other developments." Things like videoconferencing and the Web.

The challenge is developing affordable charging models. "[T]here's a huge cost in installing this stuff," Payne added. "We need to load it onto the subscriber in a way which amortises it over a decade."

Oh, imagine that! Pity Telstra can't.■

Modem check

Confusion over 56K modem standards has meant many Net surfers have held off upgrading their 33.6K modems in the past year. Since the ITU (International Telecommunications Union) approved the draft for V.90 in February 1998, modem manufacturers have rushed to put out models that comply with the new unified standard. V.90 was to be ratified in September this year, but it still had not been at press time.

The latest 56K modems are based on either US Robotics x2 or Rockwell K56Flex technology, and most are upgradable to V.90. This usually involves downloading a software patch (a 'flash upgrade') from the modem manufacturer's Web site. Most 56K modems once upgraded to V.90 will still be able to shake hands with your ISP at 56K using its original technology (either K56Flex or x2). This capability is often referred to as 'dual-mode'.

Price Watch found that the three most popular 56K modems are the US Robotics Sportster Flash 56K, Banksia Wave SP 56 and the Netcomm Roadster II 56 Ultra SVD. The Sportster Flash 56K is based on x2 technology, and will support V.90 and x2 after being upgraded. The same goes for the Roadster II 56 Ultra SVD, except it is based on K56Flex technology. However, the Wave SP 56 does not support both standards at the same time, so if you upgrade to V.90 and your ISP does not support it you will only be able to connect at 33.6Kbps.

The connection speed doesn't really differ if a modem uses V.90, K56Flex or x2 technology. The problem lies in the fact that K56Flex and x2 modems can't talk to each other; upgrading to V.90 solves this. If you don't need your modem to talk to another modem with a conflicting standard then it is not a problem, as long as you can talk to your ISP. ISPs also need to upgrade their equipment to V.90, and this is the most likely area for delays. You still have to be careful when buying a modem if you go for a no-name brand as a lot aren't V.90 upgradable.

Prices for 56K modems have remained fairly stagnant over the past year compared to other computer hardware. In December 1997, Price Watch found 56K modems from the major vendors cost about $350. The recommended retail prices for the popular new Netcomm and Banksia models are now $295 and $279 respectively, although the average street price was closer to $250. The cheapest quote we received was $205 for a Netcomm Roadster II 56 Ultra SVD from Cydex.

By far the most commonly recommended models were Banksia's Wave SP 56 and Netcomm's Roadster II 56 Ultra SVD. Both companies are now owned by Sirius Technologies. Most store representatives recommended either or both of these models, basing their positive recommendations on the fact that they are "Australian made and Australian owned". Although sales representatives will usually only say they stock Netcomm and Banksia, other brands such as US Robotics, KTX, LightSpeed, Dynalink, Hayes, Aulink and Web Excel are available. Be careful to check the modem you choose to buy is Austel approved.

Many modems on the market have SVD (simultaneous voice and data) capability. This tends to be pushed as a selling point but in reality it is not practical for most people. Using the voice capacity takes up bandwidth, and detracts from the overall Net performance. SVD is really only a major plus if you do a lot of videoconferencing. For this purpose the Roadster II 56 Ultra SVD includes a headset, and can operate as a hands-free speakerphone. The Wave SP 56 also allows hands-free conversation but does not include a headset.■

Our charter and method

Price Watch is an exercise in comparative technologies and relative prices. All investigations are conducted anonymously, and records are kept of conversations. Prices and system capabilities printed here are provided by the sales staff at the offices we contacted, and all information is as supplied. While we assume that these are correct, we cannot accept any responsibility for errors or omissions. Neither will we be held to account by companies mentioned here for omissions to product ranges or system capabilities. The responsibility rests with sales staff to provide adequate information, as the company would expect them to do with every customer.

56K modems

Company	Contact	Components	Price
Absolute Computer Mart	(03) 9663 2411	Aulink 56K, V.90 upgradable	$165
		Banksia Wave SP 56	$259
APT	132 278	Banksia Wave SP 56	$249
Computer Market Australia On Line	http://compute8.over.to/welcome.htm	Banksia Wave SP 56	$260
		Netcomm Roadster II 56 Ultra SVD	$210
		US Robotics Sportster Flash 56K	$230
Cydex	(02) 9411 5088	Netcomm Roadster II 56 Ultra SVD	$205
Distinct Computer Solutions	(02) 9821 3555	KTX external 56K, not upgradable	$135
		Banksia Wave SP 56	$290
		Netcomm Roadster II 56 Ultra SVD	$290
Harris Technology	(02) 9925 9925	Banksia Wave SP 56	$279
	http://www.ht.com.au/	Netcomm Roadster II 56 Ultra SVD	$292
Polygon Systems	(02) 9518 9745	Netcomm Roadster II 56 Ultra SVD	$285
		Banksia Wave SP 56	$259
		Web Excel 56K	$155

Can a company that once lost your business ever earn you back as a customer again? ***By Roulla Yiacoumi***

Winning them back

With hundreds of different companies providing the same products and services, the laws of competition say that if Product X makes you unhappy, you will simply switch to Product Y.

In practice, however, you may find this isn't always quite so easy. If you have signed up with an ISP and paid an up-front fee, you may have problems obtaining a refund. If you have ordered a PC from a company and it fails to supply your goods in time, it may not be worth your time or trouble to cancel the order and look for a deal elsewhere.

Here is an example of a customer service problem which the vendor resolved in a sincere and genuine manner:

Dear APC,

In June I ordered a Dell Dimension XPSR series computer with the lot. Dell duly deducted the amount (over $5,000) from my credit card and told me it would be delivered in 10 to 12 days.

After about nine days, I called Dell to find out when the system would be dispatched. That was when the real problems started. Dell deliveries told me that my order was not an order at all, and that it was sitting onscreen as a quote only and that they would transfer me to the sales team to sort out the problem.

Well, the sales team were apologetic, and quickly passed the blame on to the finance department. I was told my quote would be turned into a 'real' order and passed on to the manufacturing department with 'priority' written all over it. I asked when I would see the system that I was now $5,000 out of pocket for, and I was told 'in around seven days'.

Being a bit cautious, I waited a couple of days and called Dell deliveries to make sure it had been dispatched. Oh, sorry, Penang is waiting on parts for your system! Inquiries over the next few days finally resulted in me being told that my system had now been built and that they would get back to me with a departure date from Penang, and that I would be kept informed.

Ha! What a joke! No-one phones back, or if they do it's days late. Poor excuses are made ("We're very busy"). I did get a phone call from them last week, saying that my system had cleared through customs and had left Dell for Brisbane to come to me (I'm in Darwin), and that I should expect delivery on Monday.

Well it's Monday and I've called the freight company to see when they are likely to deliver my PC. They told me my goodies are not on their list, and suggested I check with Brisbane to see if my package has left yet. So I called Dell deliveries and had to leave another message. And another, and another. It's three hours since I left the last one and still no call from them. It's just hopeless. It's nearly a full month since I placed my order, I'm over $5,000 out of pocket, and there are no goods on the horizon.

The customer service has been very polite but very inept. Phone is really the only method of communicating with Dell, but only on their terms, if the time is right, if they're not busy, if the moon is in the third quarter of Saturn and they feel like it. You may recommend Dell's products (your reviews helped me make the purchase), but unfortunately the reviews are not able to comment on just how hard it is proving to purchase a system from Dell.

Clifton Campbell
Casuarina, NT

Dear *APC*,

Dell is the world's leading direct manufacturer providing 'build to order' systems within 10 working days from acceptance of our customer's order. The vast majority of our orders meet this 'standard'. Indeed, a large number easily exceed this standard.

Clearly Mr Campbell has not experienced anything near to a satisfactory delivery time frame. I am glad to say that instances as detailed by Mr Campbell are the exception and, in this case, human error was to blame.

Dell is renowned for providing products which are reliable and dependable. As we build all systems to order and ship directly to our clients, you will understand that quality control during and after the build process is of the utmost priority to Dell. This 'quality' control clearly extends to ensuring we deliver exceptional customer service. When you deal direct with Dell 'the buck stops' with Dell.

Apart from ensuring that Mr Campbell's system arrives safely in Casuarina in the Northern Territory, we will be treating his order as if it were made the day he received his system — crediting Mr Campbell the reduction in cost since he originally ordered his unit (Dell leads the industry in providing customers with the latest technology at the best possible price). Also, as a gesture for his patience in allowing us to resolve the matter, we will be refunding his freight and onsite warranty charges.

We hope this provides Mr Campbell with a level of customer satisfaction to justify his choice of Dell.

Willie Law
National Dell Direct Manager

As a further gesture of goodwill, Dell offered to upgrade the customer's 19in monitor to a 21in at no cost.■

CONSUMER

Tell us all about it

Service & Reliability is *APC*'s consumer column. We invite you to send details of your buying experiences to:

email complaints@acp.com.au
fax Service & Reliability at (02) 9264 6320
mail Service & Reliability, Australian Personal Computer, Level 8, 54 Park St, Sydney NSW 1028.

Please keep your letters to no more than 300 words. All letters must contain a full name, address and contact phone number.

APC reserves the right to edit any submitted material for length and clarity.

We can publish only a selection of letters each month and regret that letters cannot be answered personally. Please note that issues in this column are discussed in relation to federal consumer laws, and readers should contact their respective state consumer affairs or fair trading department for relevant local information.

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Knowledge management has evolved into a usable — and highly useful — system.

The search for meaning

Although it provides a way of organising a company's collected wealth of information, implementing document management is often a difficult exercise. This is not because the technology is difficult to put in place, but because it requires a carefully defined organisational structure that demands diligence from every employee within a company.

Companies that have until now shunned document management may find a suitable option in the knowledge management systems that are finally making the move from research labs into usable product. A quantum leap from existing full-text indexing systems, knowledge management tools instead use linguistic analysis algorithms to search for the meaning of corporate information.

Just as data mining allows companies to find subtle patterns in large volumes of historical data, knowledge management is providing a new view of corporate data stores that focuses on bringing information to employees, not the other way around, as with document management. It's an approach that is quickly gaining favour with information-heavy corporations, not only because it obviates the need for dramatic cultural change but because it provides a way of accessing the massive volume of information that is unavailable across the board because it is locked inside employees' heads.

Indeed, a recent survey by Melbourne-based research firm Delphi Consulting Australasia found that 88% of the 181 respondents are planning to implement a formal knowledge management infrastructure within the next four years. The motivations for these plans are clear: one third of the respondents said the primary repository for corporate knowledge is within their employees' heads, while 64% said on-the-job experience and personal guidance are the main form of knowledge dissemination.

Widespread recognition of the need for a formalised knowledge management infrastructure has created a massive new market over the past two years; Delphi Consulting figures suggest the worldwide market grew from nothing in 1996 to $US146 million in 1997 — $US94 million of which came directly from product licenses.

"Information in context becomes knowledge," said Delphi chief executive officer Jeff Sussman. "In the past, a lot of the tools were good at finding information for us, but because they weren't putting information into context, they weren't making life any easier for us. Full-text searching was really just based on accuracy, but accuracy brings back too many documents for us to bother with."

Long-time document management vendor Insight Technologies is among the companies moving into knowledge management. Using technology originally developed by defence researchers at Cambridge University, Insight's Knowledge Insight tool digs through corporate information repositories — databases, document management systems, and workflow systems such as Lotus Notes — and uses neural network and pattern-matching technology to analyse the construction of documents. This approach lets the system examine the meaning of corporate information instead of simply matching keywords.

"Implementing document management raises many issues within organisations," said Sandra Clark, managing director of Insight Technologies Asia-Pacific, "and once you implement document management in a certain way you've got to follow that. With document management, the filing system is only as good as the classification you give it, and it's a massive effort to go through and re-file every document if you need to use a new structure.

"The idea of knowledge management is that users don't need to know where the data is coming from," Clark continued. "They just have to know the question they want to ask, and they'll get information they didn't even know was there from sources they didn't even know were there. Many people find that using a knowledge manager, a lot of the problems they've had with document management will start to recede."

Call centre applications are likely to be the killer app for knowledge management, and nearly 17% of the Delphi survey's respondents named it as a key motivator for implementing such a system. Because they aggregate information from various sources, knowledge management systems can create a more continuous customer care interface that lets support staff resolve problems more quickly. Not only can they access records of similar problems in the past, but context-based searching can suggest other areas that might merit a look.

Today's knowledge management systems also operate proactively, monitoring individual users' activities over time to profile their areas of interest and suggest relevant new information as it is generated. Say, for example, you're an accountant within a large company that specialises in tax-related issues. You often call up financial news using the knowledge management system. Now, say one of your associates in another department writes a policy document about the impact of a new tax on the company's revenue flow. Knowing your interest in tax, the knowledge management system would automatically forward you the new document.

Open Market this month relaunches recently acquired text indexing company Folio in Australia, a purchase that is giving the Internet commerce vendor a foothold in the burgeoning information management space. "Companies are increasingly looking for particular information to support their decisions," said Open Market Australia channels manager Chris Bunn. "This is where [intelligent information handling] becomes very tangible. Intelligent, predictive agents will become a necessary part of differentiating companies' access to their information."

Proactive delivery of relevant content will help companies create what Sussman says is the real goal of knowledge management systems: community. "Collaboration is one step away from innovation," he said. "The whole objective of these systems must be to find connections within the organisation. By building patterns of people who are executing similar types of queries, they can help build a spirit of collaboration. That's where the strength of your innovation is going to come from, by being able to repeat the serendipity of what has happened in the past. When good ideas happen, companies want to make sure they happen again."

David Braue

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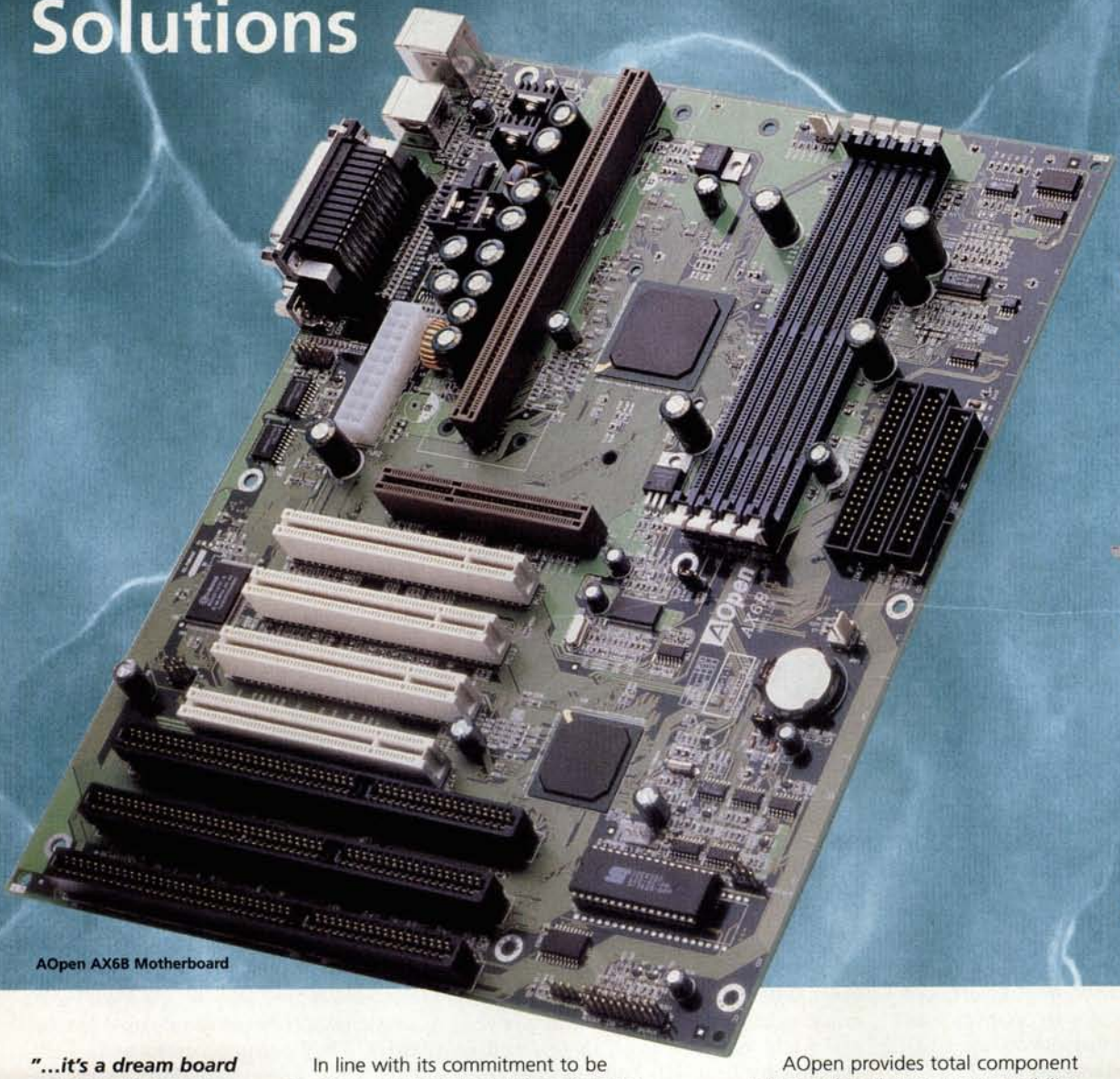

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And you thought no-one wanted a 386 computer any more.

Old but not out

Despite some people's efforts to replace PCs regularly to keep up with the latest and greatest on offer, other people are quite happy with older models. Bruce McCabe noted in September *APC* (see page 50) that there are still XTs out there running businesses and clubs. What may appear an archaic system to a technophile, or an ineffectual piece of outdated junk to a corporate manager, may be a treasure to someone who can't afford a new PC or who doesn't need the latest and greatest technology.

The relentless advance in technological change may keep businesses and individuals purchasing (and multinationals in healthy profits), but it also creates an opportunity for others to make use of the surplus. Technical Aid to the Disabled (TAD), for example, has a unique recycling service which supplies donated computers to people with disabilities and those caring for them.

TAD founder George Winston noticed the first signs of computer dumping when XTs were beginning to be replaced by 286es in the early 1990s. He also observed the benefits computers offered people who were unable to communicate due to physical disabilities. The dumping allowed those previously unable to afford to take advantage of technology, to do so.

The organisation accepts donations of anything from a 386 up, as well as serial mice and mats, inkjet and 10in dot matrix printers, VGA and SVGA monitors, soundcards, components, cables and batteries. Volunteer technicians service and refit the equipment and it is sent out for a small loan fee to users. If it can not be used by TAD, the organisation will then try again to recycle goods by passing them on to others who may use them.

There is a steady stream of equipment sent to TAD. The majority of Australians love purchasing technology. Nearly one-third of the population owns a mobile phone and our level of PC ownership is second only to the US. Growth is being fuelled by interest in the Internet as well as advances in multimedia-capable devices.

Over 1.5 million PCs were shipped in Australia in 1997, and IDC estimates that figure will increase to 1.65 million this

year. The majority of these were purchased as replacements for existing systems that then ended up in landfill.

This waste of resources and its impact on the environment have been well noted in past Reprogramming columns. It is often very difficult to find any alternative to sending equipment to the dump, however. Older model computers were not made to be easily recycled or upgraded, and while there are organisations in the community that will happily take discarded systems and peripherals, they are not always easy to find.

TAD is one organisation that is always looking for computers to recycle. At present the NSW-based service has 70 people on the waiting list for a computer, according to development officer Julijana Trifunovic. Loan computers are available to anyone who has a physical, sensory, psychological or developmental disability and a reasonable chance of their quality of life being improved by having a computer available. Their requirements are assessed and, if needed, equipment will include such things as a basic talking word processor, soundcard, text enlargement, a printer and so on.

The equipment is gathered and couriered to the user by a volunteer who will install it and provide basic tuition. TAD attempts to recycle skills as well as systems. Most of the volunteer technicians are retired engineers.

Software comes pre-installed but can be upgraded and added to by the user. Requests for upgraded hardware are serviced if appropriate. About 40 computers are sent out every month across NSW, while TAD supplies similar, if more restricted, services in Queensland, Victoria, South Australia and Western Australia.

Suzanna, the first recipient of a computer through TAD, in 1992, has regularly updated her computers. She has cerebral palsy and is unable to vocalise effectively, so she uses her computer to communicate her needs. She now attends TAFE courses in computing and has written a book of poems.

Another recipient graduated from Sydney University with a BA degree before contracting osteomyopathy, which has caused his sight to deteriorate. With his talking word processor he has regained contact with friends and colleagues.

Not all people end up keeping the computers, but the system provides a good testing ground to see if one would be useful, according to Trifunovic. Using the equipment is a huge learning curve, she said, and once the skills are mastered many are happy keeping the most basic of systems as they are simply used to type letters. They become comfortable with what they have and don't want to upgrade. Others are more keen to advance, she said.

One man with cerebral palsy, who has no control over the movement of most of his body, uses his toes to type on the keyboard. When TAD was called to take away the computer, workers assumed it was because he could not use it. Instead he typed a note which read: "Get rid of this shit box. I bought a new one with my pension."

Although it accepts very basic machines, TAD has noticed that individuals and companies are beginning to donate much more powerful PCs, including some with Pentium processors. Trifunovic said many people are upgrading due to concerns about ensuring Y2K compliance. The technology wheel continues to spin.

Selina Mitchell

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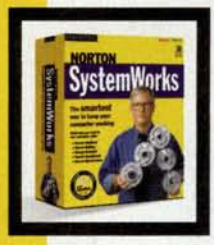

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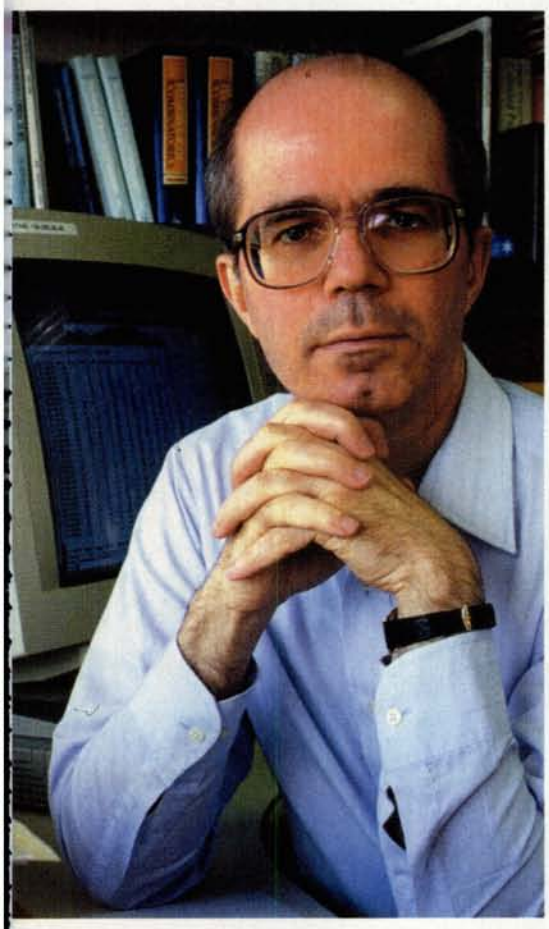
Conventional wisdom says the Internet needs different levels of service to expand. AT&T's Andrew Odlyzko argues everyone should be treated better.

Quality and equality

By Dan Tebbutt



The Internet is the ultimate classless society. Internet routers simply don't distinguish between an online tax return, a million-dollar extranet supply line deal and an IRC flame war. It's all just packets.

But experts suggest that the Net will need to become more discriminating before it can move to the next level. If the global IP network is ever to become as mission-critical in society and commerce as the phone system, we'll need to implement quality of service (QoS) levels. Essentially this means you get what you pay for: government and business could cough up more to guarantee their transactions arrive on time every time, while recreational surfers would tolerate a little delay in order to save money.

Infrastructure providers agree QoS is desirable — not least since it will allow them to charge enterprise customers more for value-added services. Telephone companies, Internet service providers, networking vendors and Internet standards bodies are working feverishly to develop QoS engineering. The telcos piously preach asynchronous transfer mode (ATM) as the perfect approach to differentiated service. Unconvinced, the Internet community is devising alternatives like Resource Reservation Protocol (RSVP) and Multi-Protocol Label Switching (MPLS), a standard for proprietary vendor technologies that allows faster switching to replace routing (see *APC* September, page 26).

Against these commercial and technological imperatives, Andrew Odlyzko is something of a heretic. A researcher with dominant US long-distance carrier AT&T, Odlyzko believes there is an alternative to differential service levels: give *everyone* better service.

"After studies over the last year looking at what's going on over the Internet, I am not so sure that you need QoS," he told *APC*. "It might be economically optimal to provide high-quality service for everything. My guess right now is that it might actually be best to strive for that goal as opposed to putting much more complexity into the network for quality of service measures."

His work is based on intensive examination of traffic behaviour on large data networks around the world. Analysing usage patterns on research networks, corporate leased lines, university campuses, telco infrastructure and Internet backbones led Odlyzko to conclude that, rather than QoS engineering, more bandwidth is the best way to improve Net performance.

Odlyzko argues QoS engineering proposals like RSVP, ATM and MPLS would significantly increase Internet complexity without ensuring higher performance for Net users. "Quality of service for the network does not guarantee anything about the quality of service that's perceived by the customer," he said. "That's a very serious defect in the quality of service measures that are being worked on.

"Quality of service covers a wide umbrella of different approaches. Many are too complicated . . . Others would force the Internet into a straitjacket."

ATM no salvation

Despite his telco affiliation, Odlyzko remains unconvinced about the merits of ATM. "I do not see it as a solution today and I doubt whether it is going to be a solution in the future," he said. Empirical data suggests ATM does not address the real characteristics of Internet traffic.

"The problem is that ATM was designed with a vision that the network would be doing something very similar to the traditional voice network in which you have lengthy conversations or flows. You also have reasonably well-defined bandwidth and latency guarantees. That is true for voice communications. That is true to some extent for the multimedia

communications that have been expected to dominate at some point. [But] that is definitely *not* what we see on the network today," he said.

"My conjecture is that this is not what we're going to see in the future. That's a very heterodox view, contrary to accepted wisdom, but I have documented that that is not what we see on data networks, especially when you look at the lightly congested private line networks. These consist of very bursty traffic and we can see why that might be so, because most Internet traffic today is HTTP."

ATM advocates tend to underestimate the importance of Web traffic, Odlyzko feels. "Web browsing encompasses a variety of important applications, many of them mission-critical, such as when your customers might be ordering from you or your doctor might be looking up information relevant to your sickness. It's all transacted through the HTTP protocol, and that leads to bursty traffic. Usually the traffic consists of relatively few packets so you do not have a well-defined flow. Sources are dispersed all over the world, the transactions are very brief, and you don't have a well-defined bandwidth requirement because basically what the end user cares about is getting the stuff to the browser right now.

"That's not the world for which ATM was designed," he added. "You might say HTTP and the World Wide Web is just one of many things, and eventually we are going to have packet voice and multimedia applications on the Internet. That is true — but my guess is that by the time those things do migrate, there will be so much other packet traffic that this will be a very small fraction of the total.

"What is likely to dominate is machine-to-machine communication, where again, what would matter is satisfying end-user desires." These mechanised transactions will be triggered by human demands, said Odlyzko. "One example is in the medical arena: it's not practical right now for radiologists to do telemedicine because the bandwidth requirements are too high. They want to transmit many huge, multi-megabyte files within a few minutes. Current networks will not support it. Future networks will, so the world where I envisage telemedicine working is one in which the surgeon who finds something on the operating table can consult with a specialist and transmit images. The specialist might want to search for similar images.

"So there will be a whole set of transactions with software agents running to different databases — but all in response to urgent human need. That will then lead to very bursty transmissions, not the ATM world of long-lived, well-defined flows. That's why I don't see ATM as a solution."

"By the time voice and multimedia migrate, there will be so much other packet traffic that they will be a very small fraction of the total."

Change of heart

Odlyzko was not always opposed to quality of service. Only a year ago he published 'A modest proposal for preventing Internet congestion' (see http://www.research.att.com/~amo/doc/networks.html), a paper that offered a new approach for enabling QoS.

The paper set out a method to use cost rather than technology to differentiate service. Odlyzko argued the Net could be partitioned into a number of logical networks, each with varying transmission fees. There would be no formal QoS guarantees, and all traffic would be treated equally within its logical subnet. The theory, inspired by Paris Metro Pricing (PMP), was that most customers would prefer the cheapest network, so heavy loading would slow its performance. Meanwhile, a minority of customers needing faster service would pay more to use lightly loaded segments. If too many people upgraded, performance would lag; this decline in service would encourage some people to downgrade to save money, thus alleviating congestion in a classic self-regulating market.

In keeping with his current ideas, the proposal celebrated Odlyzko's conviction that "simplicity was of the utmost importance". "I felt PMP was the easiest way to provide people who are willing to pay more with higher quality service. In that kind of environment you would be getting higher quality service on average."

Indeed, PMP-style class differences already exist to some extent. Expensive private leased lines give well-heeled customers low utilisation and more responsive networks for a price. Semi-public ATM and frame relay networks deliver good performance for slightly less, while the vast majority of Net users remain attached to cheap, low-bandwidth options like dial-up modem links and ISDN.

"When I looked at what happens in private line environments I saw that power users in general do pay more," explained Odlyzko. "What people care about is latency — not just latency for a single packet, but the latency for a whole transmission such as a Web page. That is worth something. Various people will pay more for low utilisation because they really care about being able to transmit quickly. In that sense there is a certain very rough equity whereby the power users do pay more because they utilise their networks at lower rates."

Lower utilisation levels

Therein lies the crux of Odlyzko's thesis: better network performance derives from lower utilisation levels, rather than complicated QoS technology. It's a larger version of the dilemma many corporate network managers face in congested local area networks — namely whether to throw cheap bandwidth at the problem or deploy more sophisticated technology to better manage bandwidth. In ATM's heyday, bandwidth management seemed the logical answer. But fast, low-cost Ethernet hardware made bulk bandwidth an easier alternative, so now desktop LAN users generally have the luxury of bandwidth far above their average needs.

Can this over-engineering approach translate to the Internet? Odlyzko believes it can if there is sufficient network traffic aggregation and a competitive market for bandwidth. The more traffic transfers to the Net, the more efficient it will become, he thinks.

"The main question for the future of the Internet is whether customers are willing to pay for high quality by having low utilisation rates, or whether many links will be congested, with QoS providing high quality for some select fraction of data transfers," Odlyzko wrote in a recent research paper on network economics. The paper concludes that optimal traffic management is "unattainable, and we should seek the simplest scheme that works and provides necessary transmission quality . . . Network managers will have a hard time making everything interoperate satisfactorily even without worrying about QoS."■

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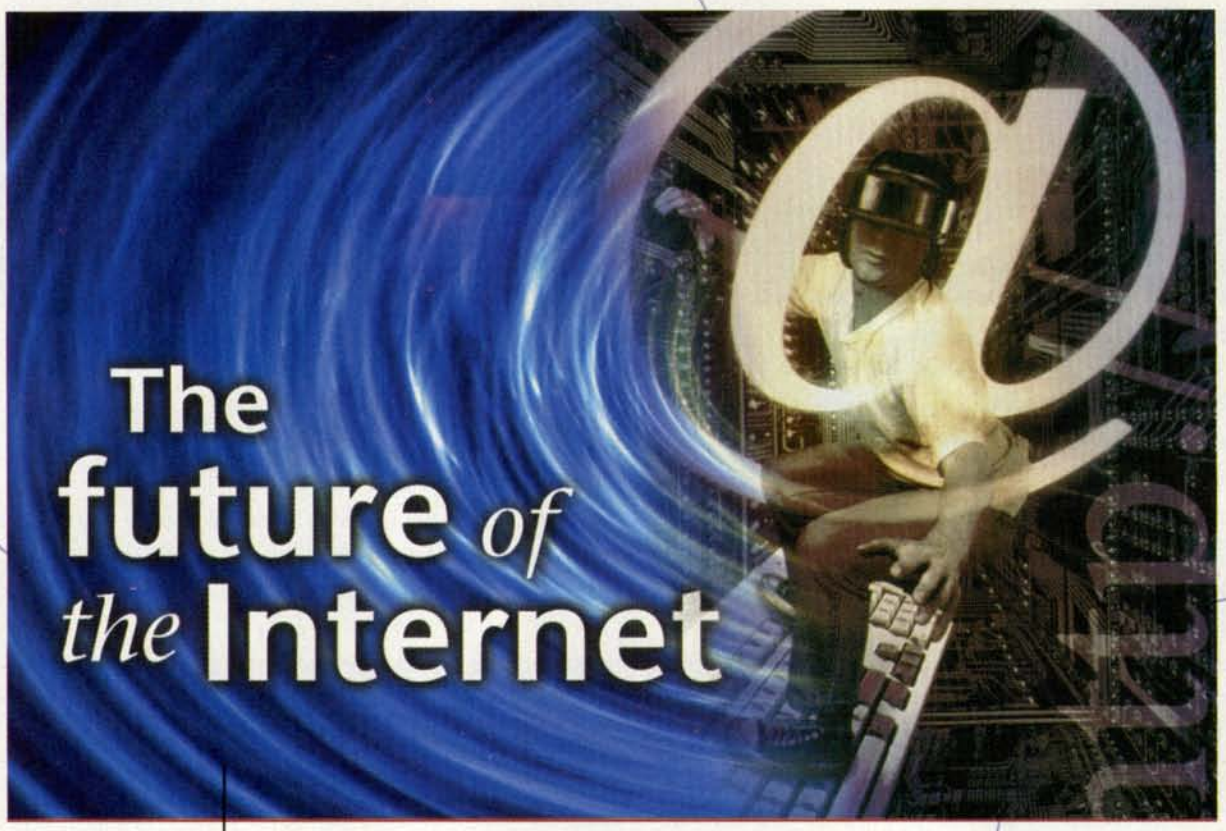


The future of the Internet

By Nathan Taylor

The Internet is growing and fracturing into application-specific segments.

Ever tried using a Web phone? You know, that software that digitises your voice, packets it up, and sends it over the Internet? At the other end it's received by another computer, decoded and played back to somebody, who can respond in kind. It sounds ideal, the concept that we can make voice calls over the Internet without incurring horrendous long-distance call charges.

Soon after trying to use a Web phone, however, most people realise what a wonderful tool good old text-based email is.

The problem is the Internet. It's growing so fast (400% a year, some estimates say) that the infrastructure is struggling to keep up. According to Telstra, there are between 1.5 and 2 million Internet users, along with 62,000 businesses connected to the Net in Australia alone. There's a modem in 28% of households, and on average these modems are used to connect to the Internet for 6.5 hours a month. That's a lot for a network that was originally designed with a few hundred users in mind.

And so, disillusioned with the current Internet's ability to deliver data at a rate and in a fashion that is reasonable for their particular organisations, many groups have begun developing their own networks. The development of services like Wireplay and the Notes Public Network are symptomatic of the problems with the current Internet — appalling lag times, inconsistent service and questionable security are all hallmarks of the Internet as it stands.

Yet, with the use of IP and various interconnects with the network we currently know as the Internet (centred on Telstra's Internet backbone in Australia), these new networks are simply becoming application-specific subsets of the existing Internet.

This is probably best epitomised by telecommunications provider Telstra's recent experiments with voice over IP. For the past three or four months, Telstra has been experimenting with technologies designed to transmit phone conversations via Internet-like networks. While this may seem like Telstra shooting itself in the foot, it is ample proof that even Telstra has come to realise that 'IP on everything' is a likely reality.

We've gone ahead and taken a look at some of the networks and technologies that will define the future of the Internet. It's not certain, of course, that these will be the defining aspects of the new Internet — but they are a good way to bet.

Contents

Page 73 A look at the advanced networks being developed around the world to provide universities and other research institutions with capabilities beyond those of the current Internet.

Page 76 A discussion of the means by which we will be accessing the Internet in the near and distant future.

Page 86 Seven rarely discussed technologies which are critical to the continued evolution of the Internet.

The research networks

By Nathan Taylor

Telecommunications companies are expanding the size of their Internet backbones, and have been for a number of years. And they're doing it fast. The explosive demand for Internet bandwidth has led them to boost the size of their local and international pipes tremendously. As I write this, Telstra Big Pond Direct (the primary Internet backbone in Australia) has a total bandwidth of 191Mbps to the US, along with numerous multi-megabit links to New Zealand, Japan, Korea and Europe. Just a year ago, Telstra's link with the US was 130Mbps, and its links to other international centres were negligible or nonexistent.

But Telstra, like most other telcos, is simply responding to demand. Telstra certainly does not take a proactive approach to Internet bandwidth, anticipating demand and building the network to suit ahead of time. Its backbone does not support advanced applications, like real-time multimedia services, multicasting or quality of service (QoS) protocols.

That is the domain of the advanced research networks currently being developed around the world. If you read US media, you may have heard the term Internet2. While this technically refers to a particular network in the US, it is often used as a catch-all for the networks that will define the future of the Internet.

By and large, these are not commercial networks. They are designed by research organisations for research organisations, and the applications which are being developed are for scientific and artistic collaboration, not ecommerce or Web-page transfer. In their own way, these networks are a return to what the Internet was initially about — the collaboration of researchers, universities and government institutions. There are no plans to make them part of the commodity Internet, available to home users and common businesses. Yet, if history is any lesson, this is exactly what these networks will become in time. By looking at these research networks, we can get a glimpse of the technology that will define the future Internet.

The term advanced network is often bandied about when referring to these networks. And it's more than just extra bandwidth that makes them superior (although they often do possess a considerable amount of it): it's support for some of the more advanced uses of IP, to provide quality of service for real-time services, to provide security and support for the latest multimedia services.

Despite their potential to truly to deliver a unified communications media, at present they're fractured, divorced from the Internet and each other save for a few peering links. Only time, and the organisational efforts of those involved, will determine whether these networks can be truly connected to form the new Internet.

The North American plan

As it always has, the US very much leads the way in Internet development. For a number of years, quite a few government institutions and universities have had network capacity of which frustrated Web surfers can only dream. Massive bandwidth allocations to a relatively small number of POPs makes these networks ideal for long-distance collaboration: exactly what they were designed for. Two existing networks are of particular note: the vBNS and the Internet2.

The vBNS (very high-speed Backbone Network Service), a joint venture between MCI and the US National Science Foundation (NSF), was founded in 1995 to provide high-bandwidth connections for research institutions. It has done so admirably, providing 622Mbps connections to over 50 POPs using IP over SONET (Synchronous Optical Network) and ATM technologies. Currently, the NSF approves all network access points, restricting vBNS access to clients with what it describes as "meritorious research projects" — for all others, the network is currently off-limits.

The primary focus of vBNS seems to be, as the name implies, raw speed, rather than support for specific applications. Support for IPv6 and Multicasting on the network could best be described as patchy, with no native support for the protocols at all switching points.

Perhaps the best publicised initiative in the US is the Internet2 project (also known as I2), a community project involving just over 100 universities in the US, working together to form a network capable of handling the advanced applications desired by the universities. Unlike the NSF's vBNS, the Internet2 project is taking an applications focus, looking first at the applications members desire, then fitting the technologies to those applications. Managed by the University Corporation for Advanced Internet Development (UCAID), working groups have been formed to develop specifications for application modelling, collaboration environments, remote experimentation, digital libraries, telemedicine, virtual reality, distance learning and applications for the arts.

These are not the only advanced networks under development in the US. The NASA Research and Education Network (NREN), the Department of Defense's Defense Research and Education Network (DREN) and the Energy Sciences Network (ESnet) are all high-speed networks, and support the latest technologies. These networks connect to a large number of access points across the US, but none are open for commercial use.

In October 1996, however, the US government saw the need to coordinate the development efforts going into these networks. The result was the formation of the Next Generation Internet (NGI) initiative, a $US100 million per year project which took onboard the development of a coherent network fabric across the US. The stated goal of the NGI: to develop a network that provides end-to-end performance up to 1,000 times faster

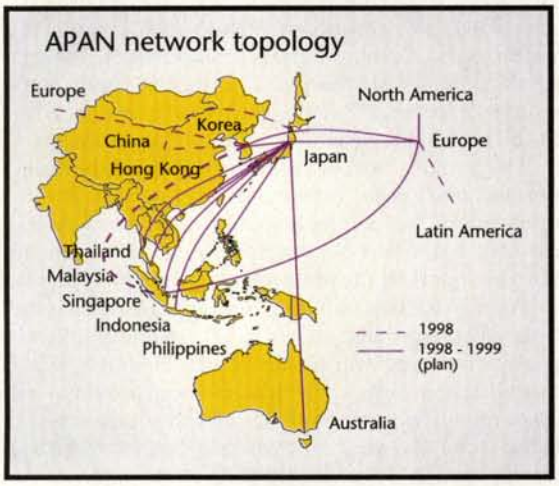
Research institutions are leading the way in Internet development.

than the current Internet, with support for advanced protocols to provide better application services.

The NGI has support from all the government controlled networks, including vBNS, NREN, ESnet and DREN, and it is working with Internet2 universities to develop interconnects with the 'GigaPOPs' on the Internet2 network. NGI is even funding some of the research going into the development of the technologies for the Internet2.

In spite of the involvement of the US government in the NGI, there are no plans at this stage to integrate the NGI into the commodity Internet, or allow consumer access to the network. It is clearly not going to be a cure for frustrated Web surfers, who will not be able to access the network unless they do so from a certified network access point.

Canada has its own initiatives underway. In October 1996, CANARIE (a consortium of federal government, the research community and the private sector) proposed the development of what would become CA*net II, an IP-over-ATM network supporting IPv6 and other advanced protocols — essentially mimicking the work being done in the US in the Internet2 and vBNS initiatives. The plan is to eventually link the networks to form an advanced network that spans all of North America.



Elsewhere

The US, however, is not the only nation with an advanced network development program. Indeed, most First World nations seem to be developing local research networks with high bandwidth and support for the latest applications.

A research network called TEN-34 services most of the European countries right now, with planned connections to those who currently have no access to the network. The TEN-34 network provides 34Mbps connectivity between the many regional national research networks, including JANET in the UK, Germany's DFN, SWITCH in Switzerland, NORDUnet, which connects the Nordic countries and Renater in France, among others. Built on an ATM platform, TEN-34 partially makes up for its comparatively low bandwidth with strong support for QoS protocols over ATM (including support for variable bit rate and constant bit rate connections). It also natively supports multicast over large chunks of the network.

The next step in Europe is the provision of the TEN-155 network — which, as the name implies, increases the bandwidth to 155Mbps between POPs. In step with this is the important development of the QUANTUM (QUAlity Network Technology for User-oriented Multimedia) project — specifically designed to advance the provision of real-time and multimedia services over high-speed networks.

So what about Australia?

Up until 1996, most collaboration between research institutions in regard to high-speed networking happened outside the Asia-Pacific region. Even at that stage, some serious effort was being put into the development of research networks in Europe and the US, but in the APEC region virtually nothing was happening.

That all changed at the 1996 APEC conference in Tsukuba, when professor Michael McRobbie, then of Australian National University (ANU), proposed the development of a high-speed research network to span Asia-Pacific — the first network of its kind in the region. Called the Asia-Pacific Academic Network (APAN), it originally had four member countries: Australia, Korea, Singapore and Japan. Many more APEC countries have now joined the fold, and APAN now reigns as the most important research network in the region.

APAN, like the NGI project, is not a singular network, but a fabric woven from numerous test-beds already developed internally by the nations involved. It has three major exchange points in Tokyo, Seoul and Chicago (the latter is an exchange point named STAR TAP, which provides peering connections with other research networks such as CA*net II), plus many points of presence across the Asia-Pacific region (see map).

Due to initially poor infrastructure, APAN is a long way from reaching the lofty gigabit speeds of the US networks. The links between and within nations vary considerably, with most in the 2 to 45Mbps range. If all goes to plan, the major links will be expanded to 155Mbps within the next few years.

APAN has also set up a number of working groups to develop standards for delivering advanced protocol services over the network. There are seven such sub-working groups: cache, IPv6, multicast, measurement (for keeping track of bandwidth, particularly for real-time applications), network design, RSVP and security. Application development groups have also already been set up, to develop specific applications for bioinformatics, education, engineering, environment, medicine and science.

At the moment, APAN seems to be suffering from a lack of funding, and it has put back several important deadlines. This is unfortunate, given that APAN seems to be the best chance we have of keeping up with international trends in research networking. Yet, if APAN can get it together, it has the potential to place the Asia-Pacific region on equal footing with the rest of the world when it comes to advanced networking.

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Faster paths to the Net

By Nathan Taylor, Selina Mitchell and Simon Vandore

A look into the successors to the modem.

The death of the analog modem is something we, and many others in the computer industry, have been predicting for a long time. ISDN, cable, ADSL (asymmetric digital subscriber line) and satellite were all meant to be our salvation from the grind of the plain old telephone system. They aren't — yet. Prohibitive pricing, poor implementation and general apathy has meant that we're still connecting to the Net at 52Kbps on a good day. It has become obvious that it will be some time before we reach bandwidth utopia.

Yet there is still light at the end of the tunnel. Here are some of the technologies that still have the potential to revolutionise the way we access the Net. Some have been discussed for some time (like cable) and are only now starting to meet expectations, while others are completely new concepts. Whether or not they come to fruition depends on the capability of large companies to deliver them.

The cable way

The data-carrying potential of the fibre-optic cables slung and buried around our cities by Optus Vision and Foxtel remains largely untapped. Traditional, one-way cable TV services are the carriers' primary focus, and so far only Telstra's cable has had any kind of TCP/IP workout.

In the US, cable modems have stolen a large slice of the telephone companies' ISDN market, forcing them to bring forward the implementation of ADSL. There's also enough competition within the US cable Internet market itself to drive prices down.

Not so in Australia. While a company spokesperson said Optus Vision's data service was "not far off", he would provide no further information. But more than 200 homes and schools are still receiving free cable Internet access from Optus Vision in a trial program which has lasted over two years. Meanwhile, several announced deadlines for the company's cable Internet service launch have passed without a sound.

ISDN, cable, ADSL and satellite were all meant to be our salvation from the grind of the plain old telephone system. They aren't — yet.

Optus's only Internet product remains its high-bandwidth Spinnaker service for medium-to-large ISPs. The Spinnaker Web site advises those interested in cable Internet to call the Optus customer support line and ask for the 'Optus Vision Online Helpdesk', but the customer service representatives to whom *APC* spoke had not heard of this.

Big Pond Cable (BPC), the service run over Foxtel's cable and launched nationally in mid-1997, remains popular with experienced Internet users, but isn't heavily advertised by Telstra. After a few teething problems, the service now runs reliably, but it will be a while before Big Pond actively encourages modem users to make the switch.

In theory, BPC offers speeds of up to 10Mbps for $65 a month (after a minimum initial payment of $668.95, which covers a cable modem, ISA network card and various set-up fees), but the pricing model includes volume charging for data transferred over a 100M-per-month limit. At these speeds, 100M is peanuts — those who spend all day listening to RealAudio or downloading demonstration software will feel their hip pocket nerve severely pinched at 35 cents per megabyte. Users to whom *APC* spoke were used to limiting their activity — they either knew of FTP servers set up by other users on the BPC internal network (the transfer measuring point is at the network's exit, so internal traffic is free of charge), or arranged to share the load by taking it in turns to download files and distribute them.

Cable speeds advertised by Big Pond can be a little misleading, however. Some users say 1Mbps is the actual bandwidth allocated to each user, despite the 10Mbps network card and modem. Obviously, file transfer speeds are limited by the behaviour of other parts of the Internet, but the highest speeds are usually possible when transferring from BPC's internal network. Theoretical upstream (sending) bandwidth is currently limited to 768Kbps.

Since the last time *APC* reported on Big Pond Cable, Telstra has introduced a new network architecture known as BIDS 2.0 (Broadband Internet Delivery System, developed by Hewlett-Packard). This makes it possible to have multiple user IDs on one account, while allowing Web hosting — 5M space is allocated per user — and domain names for BPC users. New client software was implemented for Windows and NT, and an unofficial Linux client was made available by a user (details at http://www.dragon.com.au/linux/LDP/HOWTO/mini/Cable-Modem.html). Big Pond only offers its support services to Windows users.

Various new BPC services have been launched by Telstra in recent months, such as the internal Quake/Quake II gaming service Wireplay Warp, which uses the BPC internal network as a LAN. Customers are now also allowed to use a BPC account as the primary Internet feed for an office network, not just a home account.

BIDS 2.0 has made new pricing models possible, but these are still volume-based. Downloading 200M per month costs $89 (33 cents per additional megabyte), 350M costs $130 (31 cents per megabyte, with 10M Web server space), and 500M costs $170 (28 cents per megabyte with 10M). No changes to Telstra's current cable Internet pricing have been forecast. An Optus Vision spokesperson said that while Optus was

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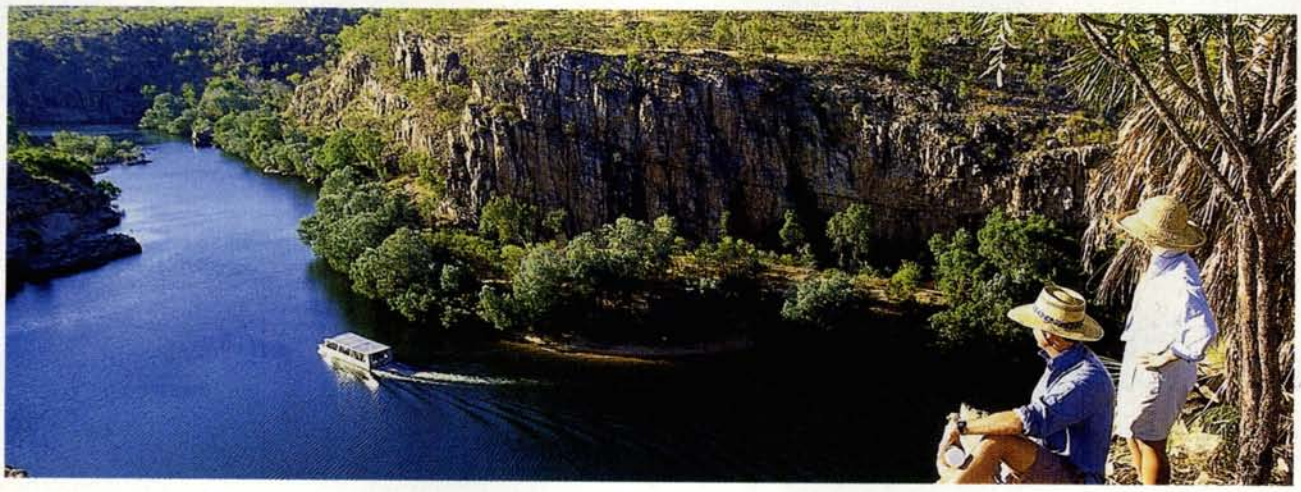

Above: A top view of Nitmiluk (Katherine Gorge). Below left: Snapped every day, by tourists. Below right: Refuelling Stop (Cullen Bay, Darwin).

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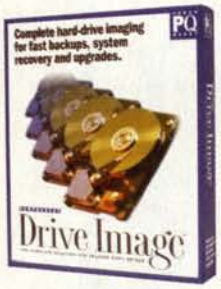

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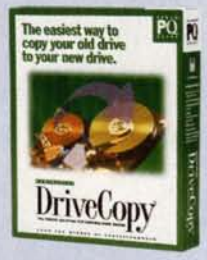

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closely monitoring what its competitors were doing in the Internet market, no decisions had yet been made on an Optus Vision Online pricing model (volume-charged or otherwise).

Will we ever see DSL?

Digital subscriber line (DSL) is often lauded as the alternative means to get fast access to the Internet — usually by US telecommunications companies concerned about the cable modem's threat to the telcos' lucrative data carriage business.

The promise: to deliver broadband Internet access to the consumer over the plain old telephone system (POTS). It has yet to deliver on that promise, despite several years of posturing by DSL developers. But then again, neither has cable. Yet.

DSL, in the US at least, comes in many flavours. The most talked about is asymmetric DSL (ADSL), which was originally designed by AT&T in 1983 for switched delivery of video. When the market interest in such a device began to wane, however, ADSL was evolved to a 'standard' for delivering data — that is, Internet access — to homes around the US.

The bandwidth that ADSL delivers varies in accordance with the length of the phone line over which it has to travel before it hits a repeater or its destination, but it can be multi-megabit downstream over short wire lengths. Its asymmetrical nature also means that more data can be delivered downstream than on the return channel. As yet, no telcos offer ADSL as a commercial service to all subscribers, mainly because of technical difficulties in getting it to reach all parts of the network.

Recent tests conducted by US ISP Avalon, whose interest in DSL was to do with servicing apartment blocks, showed that DSL was not quite ready for prime time, with many problems still being experienced during the testing. However, according to Avalon, results did improve during the course of the tests. The biggest problem the company encountered was performance rates that varied considerably across modems and line lengths. The best results received were for the shortest line length (2,000m), at which one modem achieved just over 8Mbps downstream and 750Kbps upstream; at that same length, some other modems only achieved 7,45Kbps downstream. At 6,000m, however, Avalon found that a number of the modems failed to work at all.

Given it owns a cable network in addition to its telephone network, it is unlikely that Telstra will be in any rush to deliver DSL services, even to areas that do not have cable access (which, at the moment, is most of Australia).

According to Telstra's Kerrina Lawrence, the telecommunications company is currently undertaking internal trials of ADSL technology for high-speed data services, particularly to corporate customers (which means it is probably going to be expensive). "At this stage, [Telstra] is only looking at the viability of the technology," said Lawrence. "We have no plans at the moment for a wider scale rollout, but it could be implemented at some stage in the future. We're taking a cautious approach to the technology."

Challenging telcos: Fibre to the home

While a number of utilities are considering adding the provision of communications services via their present infrastructure, the ACT Electricity and Water (ACTEW) TransAct project has a slightly different focus: it is piloting a scheme which it hopes will ultimately see ATM broadband services rolled out to all Canberra residents via fibre-optic cable to the curb. The cable will sit 40cm below the already present above-ground electricity wires that lead to most Canberra backyards. Twisted pair copper cables will then take the data to the home.

It appears Canberrans are most excited by the prospect of high-speed Internet access, but other services will also be available via the high-tech communications network, including telephone (local, STD and ISD), video (retransmission of free to air, pay TV, near video on demand and video on demand) and the resulting interactive services such as telecommuting, videoconferencing, distance education and so on.

ACTEW is only interested in providing the infrastructure and the capability, not the content. Services will be run by other companies, the Internet access by ISPs and phone services by telecommunications companies, for example. The competition will be with the providers, not with the infrastructure.

So far none of the antagonism found in other areas (such as in Sydney when Optus was installing overhead cables) has been experienced. Canberrans appear very happy to have the data communications cables installed: the area has both above-average home PC ownership and Internet access rates, according to Australian Bureau of Statistics figures. If there were problems with the overhead cables, the network would probably not be possible, said TransAct's Jane Taylor. It would be six times more expensive to lay the cables underground in established areas, and there would be no business case to do so, she said.

The focus on homes rather than businesses was a calculated business decision. The residential market has been overlooked, and there are many businesses in the Canberra residential area that would benefit from the service, said Taylor. With such services available to the home, it is hoped also that it would give the local and Federal Government departments more incentive to connect to the same network and take up teleworking opportunities, said Taylor.

Technology trials have been taking place for the past year, and the service will be tested in the Canberra suburb of Aranda later this year. Just under 1,000 Aranda residents have been asked if they would like to participate in a six-month service test. If successful, the network will be fully rolled out across Canberra suburbs with overhead electricity next year; this would take about two years. Then the remaining 20% of homes, those with underground electricity, would be cabled.

ACTEW is not the only organisation developing such services. In NSW, for instance, EnergyAustralia has also made a commitment to develop a fibre-based infrastructure. Still in very early stages, EnergyAustralia's Photonics Information Super Corridor (PISC) is intended initially to be a 'proof of concept' network, rather than a commercial enterprise. At this stage, few

details on the project have been worked out, except that the PISC will use optical fibre to connect a number of universities and TAFE Colleges at high bandwidth — at least 1Gbps (possibly more with the use of WDM). Unlike the ACTEW project, the fibre will be strung on existing power lines, although with the small number of initial nodes this is not expected to be a problem.

The network centres on the Australian Technology Park in Sydney's Redfern, which is jointly owned by Sydney University, the University of NSW and the University of Technology, Sydney. Macquarie University has also expressed interest, as have a number of TAFEs in Sydney and the Newcastle area. Early usage will involve the transfer of 3D models between university campuses. In time, EnergyAustralia also sees potential for business users and applications, although it is not looking at home use at this stage.

"Australia is well positioned to play in this area, but one of the areas lacking, because it did not suit the big telcos, was the provision of high-speed cabling," said Kerry McIlwraith, planning manager at EnergyAustralia. And while McIlwraith is not prepared to play in the telco market just yet, he believes the project has the potential to give EnergyAustralia a leg up in the provision of high-speed data services in the long term.

McIlwraith is uncertain about the long-term viability of the project, but he sees this as a chance to determine how well the technology operates in the real world. "The cost of putting in fibre . . . [means] we need to sort out more clearly who our customers might be."

Should this project and others like it prove to be financially acceptable, then lack of bandwidth, at home at least, could well be a thing of the past.

The air up there

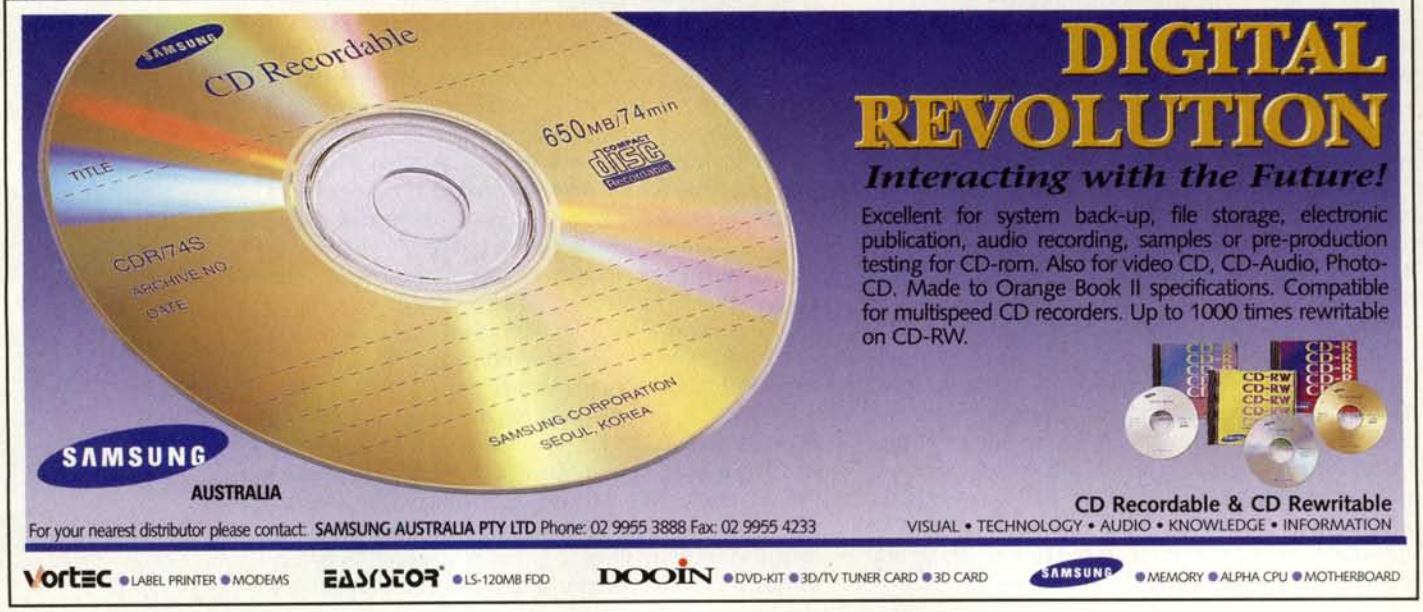
Of course, traditional land-based fibre networks are not the only kinds of advanced networks under development. When Teledesic announced that it would be sending up hundreds of satellites into orbit, it seemed this was the next phase in Bill Gates' plan for world domination. The plan: cover the earth in a huge, high-bandwidth satellite network to provide high-speed communications, including Internet access, to people in all the corners of the world.

Bill Gates (not Microsoft, but Gates himself) owns a 21% stake in the company, as does Teledesic's CEO Craig McCaw. Other principal partners include Saudi Prince Alwaleed Bin Talal, Motorola and Boeing. Together, they decided to put up over 800 satellites into low-earth orbit (LEO) to create a global data network. The number of satellites has since been whittled down to 288, but by 2003 Teledesic expects to have all these satellites up and running.

Teledesic is not the only project of its type, but it is clearly the most ambitious. Competitors like Loral, Lockheed, Alcatel and GM-Hughes are all embarking on similar satellite plans, with similar time frames and goals to that of Teledesic, but far fewer satellites. The biggest competitor to Teledesic was, in fact, Motorola's planned Celestri network of satellites. In a major coup for Teledesic, Motorola agreed instead to fold its Celestri plans into Teledesic, and became one of the major backers of the project.

This leaves Teledesic with an almost open market, but its success is far from assured. Most observers seem to agree that Teledesic faces some immense challenges in the form of funding and deadlines. If Teledesic is to meet its deadlines, it will have to build, with the help of its partners, nearly 300 satellites — and as you might expect, they're not cheap — and launch them in a very short period of time. Teledesic has projected a $9 billion cost and a launch window of only about two years.

Teledesic has chosen to use LEO satellites because they provide the lowest latency connections with ground targets. Geo-stationary earth orbiting (GEO) satellites are convenient in that they stay over a single point on the earth's surface (hence the name) and their greater height gives them a larger footprint for greater



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coverage. They've been used for years to deliver broadcast services such as TV and radio. But they do suffer from inescapable latency problems — which doesn't make them very useful for real-time interactive services.

LEO satellites, on the other hand, are relatively new. Because they orbit closer to the earth (within 2,000km), latency is decreased from a GEO satellite's 0.24 seconds to hundredths of a second. This means that using LEO satellites, real-time voice conversations become acceptable and videoconferencing becomes feasible. Applications which are super-sensitive to lag (like playing games over the Internet) will still be impossible, however.

Several problems are evident in LEO satellites. One is the speed at which they move (they will circle the earth many times in a day — Teledesic's satellites will take just 113 minutes to complete a revolution), making it hard to track and switch between satellites before one disappears over the horizon, severing the connection. They also have a tendency to fall into the earth after 10 to 12 years, requiring a replacement. And then there's space junk (see *APC* March 1998, page 66). Both LEO and GEO satellites can also suffer from a denial of service by prevailing weather conditions blocking signals, topography effects on reception and numerous other interference problems.

It's likely that both LEO and GEO services will coexist indefinitely. LEO satellites will provide access to interactive services requiring low latency, while GEO will persist as the preferred means of disseminating broadcast information, such as downloads and video. IP services will be available through both, although LEO satellites will use the return channel more, while GEO satellites will be useful for multicasting.

According to Teledesic, its network will support millions of simultaneous users with two-way connections supporting up to 64Mbps on the downlink and 2Mbps up. Larger customers will be able to get symmetrical links of 64Mbps or more. Because of the use of LEO satellites, only small antennae need to be used, no larger than 30cm in diameter. Frequencies in the Ka band of the spectrum will be used.

It appears unlikely that Teledesic will be selling directly to consumers. Instead it will probably operate through the usual service provider channels to deliver consumer services. Service providers will buy chunks of bandwidth from Teledesic, which it will then pass on to consumers.

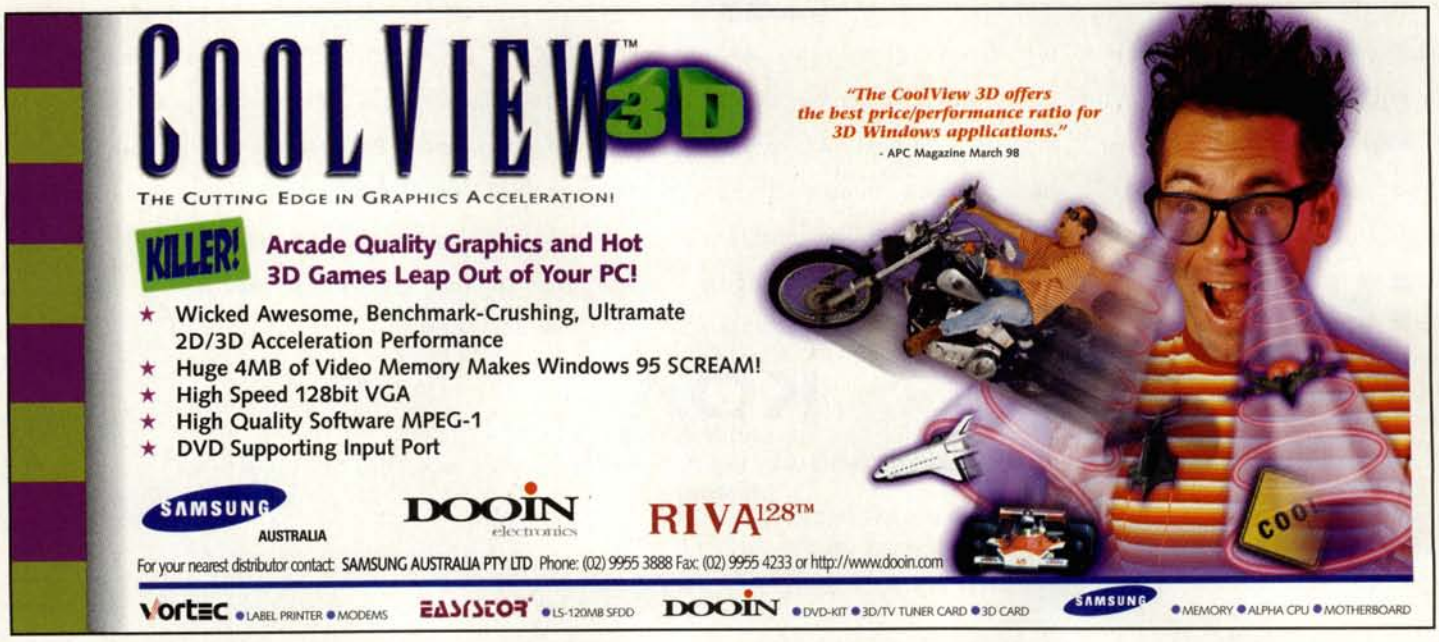
Even Teledesic CEO Craig McCaw admits that satellites will not replace land lines for most data communications, especially in the Western world where high-speed lines are almost ubiquitous. Instead, satellite providers like Teledesic will attempt to use their global scope to attract customers who do not already have access to fibre-based infrastructures. Consequently, Asia-Pacific's poor network infrastructure makes it a key market for Teledesic and other satellite data providers. Their goal, to borrow a phrase from the Teledesic manifesto, is "to provide advanced information services anywhere on Earth".

Tuning in to datacasting

If our regulators ever manage to see the light, new digital broadcasting technologies have great potential to relieve some of the Internet's current bandwidth pressure.

For its digital television delivery service, Minister for Communications, Information Economy and the Arts, Senator Richard Alston, has already announced that Australia will be using the technology devised by the European DVB. This technology, based around a modulation scheme called Coded Orthogonal Frequency Division Multiplexing (COFDM), provides specifications for terrestrial and satellite delivery of binary data.

COFDM is designed to provide high data rates and robust reception and error correction for broadcasters of digital content. It does this by using a large number of carriers within a 6 to 8MHz band, as opposed to the single carrier and sidebands others use. Each of these



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carriers supplies a small amount of binary data, and collectively they can supply about 20Mbps.

Its best known and most publicised use is the delivery of MPEG-2-encoded video, to provide a replacement for the venerable PAL television broadcast standard in use today. Because of the high bandwidth it affords, DVB-T (as the standard for terrestrial broadcast of digital television is known) will enable multiple television channels, or a single high-bandwidth channel within the 7MHz bands currently used for television broadcasts.

But COFDM has the capacity to carry so much more than just television signals. The DVB has already defined a number of standards for delivery of data other than TV — including computer files, text (rather like teletext) and service information. The most important for Internet surfers is a standard called DVB-DATA, specifically designed to provide a standard interface for data delivery over COFDM. It enables delivery of encapsulated TCP/IP packets as well as the use of 'Data Carousels' — the periodic transmission of full files, such as executables.

The standard is broad enough to accept one-to-many file broadcasts as well as conditional access systems for 'pay per download' style systems. It also supports return-channels via the DVB-RCT standard.

Given the existence of these systems, it is quite feasible that in the future, downloads and files could be delivered to us over the airwaves, and we could tune in at certain times to receive a given file. For example, a program might read: 'tune in to channel 36 at 10:05am for Netscape Navigator 9.2'. It is also ideal for the delivery of continuous (such as PointCast) and program-associated data (information associated with a television channel being shown).

One idea with a lot of potential is the use of 'spare' bandwidth to deliver data. With MPEG's variable bit rates, there may often be spare bandwidth in the television carrying channels. If your broadcast is only taking 15Mbps at the moment, why not use the extra bandwidth to provide data?

The environment set up by the government in regards to digital broadcasting is one in which the television channels will largely determine the direction that datacasting takes. Given free slices of spectrum in which to develop digital television services and datacasting services, it appears likely that the television stations will set the tune for datacasting. "We're obviously a major force in pushing the standards," said Tony Branigan, general manager of FACTS. "It is, however, hard to get a quorum of datacasters — there aren't any yet."

It is clear, however, that the focus at the moment is not on developing data services. According to Bob Greeney from Standards Australia and the ABA, "The focus is really on digital video. And that's what matters at the moment . . . At this stage we're not doing any work on setting standards for datacasting." Indeed, the main concern right now appears to be enforcing standards which prevent datacasters from interfering with television signals. Additionally, the government has laid out rather vague licensing rules in regard to datacasting, and companies will have to pay for the privilege, in addition to the spectrum.

At least one Australian ISP has aspirations to datacasting. Earlier this year, Internet service provider OzEmail made a bid for spectrum in the kinds of bands being looked at for digital broadcasting. Its bid failed. OzEmail's director of corporate relations, Michael Ward, refused point-blank to disclose what the ISP's plans were, except to say that the government has "missed the opportunity to get a head start in the datacasting industry".

This is the situation as it stands. The government has placed a higher priority on digital television than on datacasting. It has become apparent that it might not be until well into the next millennium that we see any innovative datacasting services eventuate in Australia, despite the availability of the technology now. But things have always ground along slowly in the world of broadcasting. Reruns of 'Gilligan's Island', anybody?

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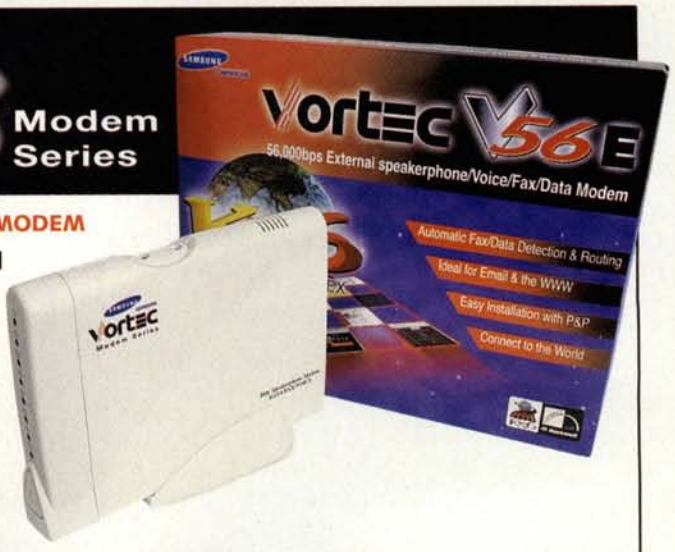

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Seven key Internet technologies

By Dan Tebbutt and Nathan Taylor

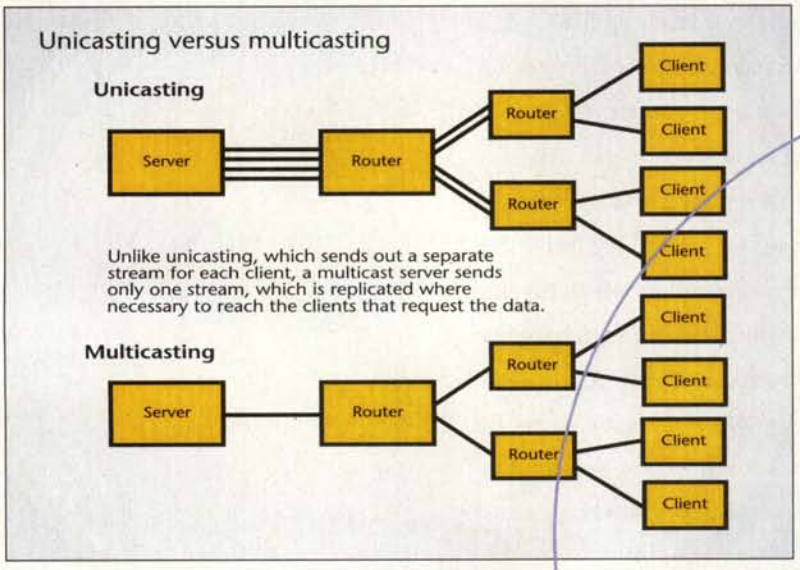
APC takes a look at seven technologies which may well define the future of the Internet.

There are many technologies working their way around the IETF and other standards organisations. Some are not new, and have simply been waiting for their day to come. Others are completely new, a response to demand for a particular type of application. Together, these technologies may just be the fabric that allows the Internet to live up to its full potential.

Multicasting

"Hey, check out this RealVideo broadcast." An email like this, sent around to an office of people, is a network administrator's worst nightmare. Suddenly, dozens of office workers fire up RealPlayer and start downloading streamed data. For each person, a separate stream is being used, quickly clogging up the office's Internet connection. The company's Web site stops working, the PPTP connection with other offices grinds to a halt and things go downhill from there.

Put simply, Internet broadcasting, with tools like RealPlayer and PointCast, are major bandwidth hogs. This is because they use traditional methods of delivering data, in which each client receives its own individual stream from the server. Called unicasting, the result is that some network segments might carry tens or even hundreds of identical network streams simultaneously.



Defined in 1989 by the Internet Engineering Task Force (IEFT), multicasting is technology designed to save us from this massive redundancy, and to make the dream of using the Internet as a true broadcasting media come true. Multicasting allows only one stream of a given cast to travel over a network segment. This stream replicates and branches when required, sending out streams along network paths only if a client at the end of that path has requested the stream. If there are no clients at the end of the branch, then no stream is sent along that line, effectively pruning that network segment from the transmission (see diagram below).

Going back to the RealPlayer example, only a single stream would come along the office Internet connection, and this stream would branch when it hit the router one step from the many clients requesting data, not before. Only those clients wishing to see the stream are delivered packets.

So why don't RealPlayer, PointCast and NetShow support multicasting? The fact is, they do: it's the Internet that doesn't. Support for multicasting is a relatively new phenomenon in routers, hubs and switches, and many older devices on the Internet will not support it. There's certainly no guarantee that multicast will be supported from end to end in a given transmission, so unicast methods need to be used.

Problems exist with TCP/IP as well. TCP usually requires a receipt recognition, unlike the 'send and pray' methodology of UDP (use datagram protocol) transports. While this is fine in most instances, it is not so useful for 'broadcasting' of IP information. IP multicast overcomes this by making regular use of UDP transports. Satellite vendors dissatisfied with multicast, however, have already petitioned to IETF, and a new working group has been formed to investigate a protocol called TCPSAT for transmission of Internet data over satellite.

One of the challenges the nations designing new Internetworks face is the problem of enforcing support for multicasting across the network, so that multicasting works seamlessly from server to client(s). This includes getting not just backbone providers into the fold, but ISPs, client platforms and even corporate networks, few of which are prepared to deal with multicasts right now.

The use of layer-2 switches, popular with corporations seeking high-speed, low-cost networking, must be banned. Clients must be IGMP (Internet group management protocol) aware in order to form and dissolve multicast groups; fortunately, most clients are. All router and switch software must support multicasting. It's a big challenge, and not one that's going to be met anytime soon.

This is not to say it's a lost cause on the current Internet. A subset of the Internet, the MBone (multicast backbone) has already been in operation for a number of years. Members of the MBone tunnel multicast packets through segments of the Internet that have not been certified as multicast-aware. Multicast packets are encapsulated inside normal unicast TCP/IP packets to be routed to a listed MBone segment, at which point it is re-converted into a multicast stream. While this is not a terribly efficient way of working multicast, it does work, and has been used to broadcast a number of events over the Internet. For

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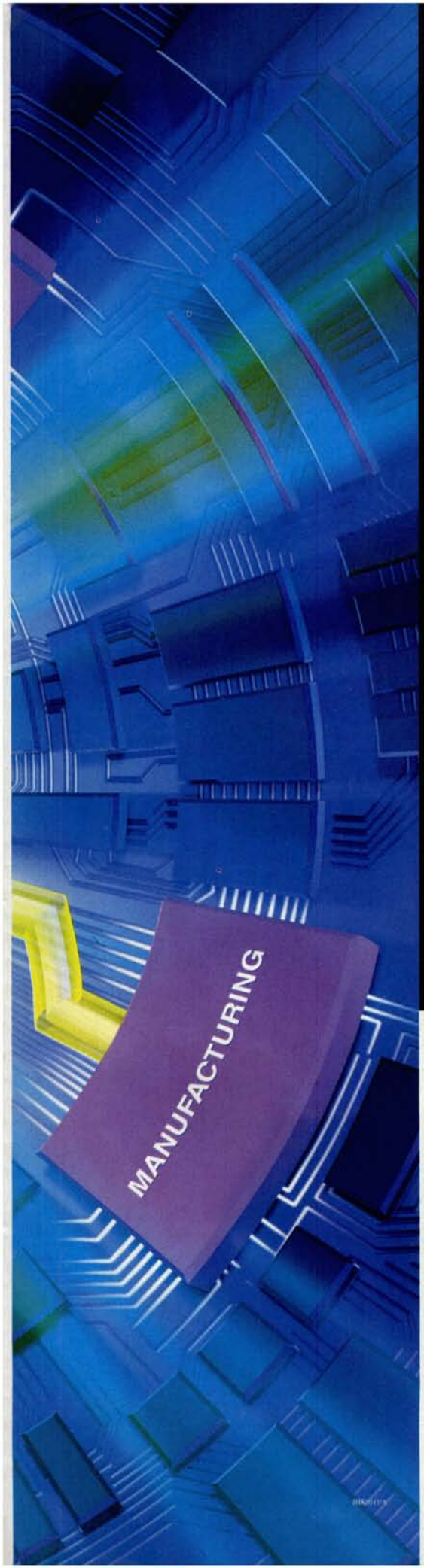

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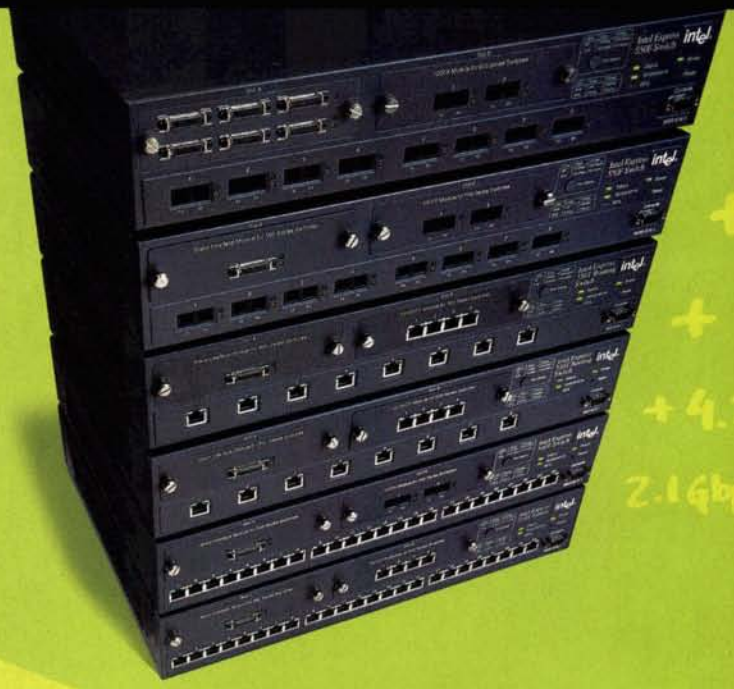

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IPv6

The Internet's capacity for crisis management is awe-inspiring. Doomsayers once warned that the Net would soon run out of addresses unless there was an urgent upgrade to the next-generation Internet Protocol Version 6. But the Internet engineering community quickly rallied to avert the impending disaster — and their efforts proved so effective that the whole future of IPv6 is now in doubt.

IPv6 began life earlier this decade as an attempt to develop a more modern foundation for Internet communications. Originally known as IPng (IP next generation), IPv6 aims to provide the Internet with a much larger address space so billions of computing devices can be connected. But the new protocol goes much further, defining security, quality of service, management and mobility extensions that offer a foundation for advanced IP-based network services.

The initial rationale was to create more addresses to allow the Internet to continue its phenomenal expansion. Current IP (IPv4) has a 32-bit range for Internet addresses — perhaps enough for the computing elite, but not nearly enough to hook up every person and device that could be networked. IPv6 increases this by a factor of billions, producing an unthinkably large address space that provides — by the most *conservative* reckoning — some 1,564 addresses for every square metre of the Earth's surface.

"Hey, check out this RealVideo broadcast." An email like this, sent around to an office of people, is a network administrator's worst nightmare.

Yet the IP address crisis has now largely been averted, thanks to canny engineering tricks that have extended IPv4's capacity. The first is Network Address Translation (NAT), a technique that allows hundreds of users on a private IP network to share a single Internet address. Particular series of IP numbers are reserved for use on intranets the world over, and NAT gateways pass traffic between private network users and the open Internet. Together with Classless Inter-Domain Routing (CIDR), a method for simplifying Internet routing, NAT has relieved IP addressing pressures to such an extent that experts now question whether IPv6 is necessary.

"The driving benefit of IPv6 is no longer big addresses," claims networking doyen Bob Metcalfe, who suggests migration could take up to 10 years. "Address management, quality of service, and security are now what we're after."

In those areas IPv6 presents a strong case. IPsec security is mandatory. Packet headers support differentiated classes of service and even identify individual flows so that, for instance, delay-sensitive IP telephony can be handled differently from bulk newsgroup traffic. Enterprise management features allow IPv6 products to gather network information automatically, while network managers can configure changes and manage addresses much more easily. Mobile IP support will ensure IPv6 networks happily accommodate roving clients such as mobile phones, laptops and PDAs.

But these advantages don't mean IPv6 is a shoo-in. In fact, each strength is also likely to appear in IPv4 — and probably sooner. Given the enormous legacy investment in IPv4 and the address space reprieve, the next-generation protocol is now struggling for momentum.

Certainly major Internet vendors are in no rush to support it. Dominant Internet hardware vendor Cisco has not moved its software beyond beta, even though rivals like Bay Networks, 3Com, Nokia and Cabletron already have production-grade IPv6 support. Consequently some test sites are routing IPv6 on general-purpose workstations using Linux or Digital Unix. In March Microsoft released a development version of IPv6 for Windows NT, but it lacks vital features and is only really useful for compatibility testing and development. Novell is encompassing IPv6 within its larger effort to port NetWare 5.0 to native TCP/IP.

IPv6 can coexist happily with IPv4 on the network, but unfortunately software developers face compatibility problems. Most current applications including Web browsers, FTP and telnet are hard-coded for IPv4 addresses, so tweaks will be necessary to support expanded addresses and other features. Windows developers would expect any rewrite to support Winsock 2.0, which even Novell is endorsing as a common OS-level networking API. Apple demonstrated Mac applications running unmodified with IPv6 as far back as 1995, but the demise of Open Transport in Mac OS X makes recoding inevitable.

IPv6 experiments are currently under way on a test-bed network called 6Bone (http://www.6bone.net). Nodes worldwide are connecting by tunnelling IPv6 across the IPv4 Internet. Australia has just two nodes on the network, and no backbone connection at present. Mainframe developer Keith Owens, who operates a 6Bone node on a Linux box in Melbourne, says interoperability between the two generations is smooth. His experience reworking several Linux applications shows the changes required are usually minor.

For now, however, IPv4's Dr Who-like powers of regeneration could make IPv6 rather slow to materialise.

Quality of service protocols

Delivery of real-time multimedia services is crucial to advanced network development. Voice over IP, video delivery over IP and radio over IP are all seen as defining characteristics of the new Internet. There are a number of problems with implementation, however

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— one is that IP is inherently bad at dealing with these kinds of services (it was designed as a data, not multimedia, delivery service). The other is that, on the Internet, you never know what you're going to get. Packets get lost, delayed and routed to all corners of the Earth — not very conducive to delivery of real-time services.

In order to overcome this problem the IETF set about defining a new set of protocols for delivery of multimedia content over IP networks. These should be fully supported in many of the new networks.

RTP (Real-time Transport Protocol) is an IP-based protocol optimised for the delivery of multimedia content. Its expanded header incorporates information regarding the timing, synchronisation and the order of frames of multimedia content. RTP is already in use on the MBone, and will be important for the future of multimedia content delivery over the new networks.

A related protocol, **RTCP** (Real-Time Control Protocol), is designed to provide feedback to applications about the state of the network. All the participants in RTP sessions are periodically sent RTCP packets, which contain sender and receiver reports on packet loss, packets sent, jitter and so on. Applications using RTCP can adjust their settings accordingly.

A proposal submitted to the IETF by Netscape and Progressive Networks, **RTSP** (real-time streaming protocol) also works in conjunction with RTP, and defines a platform-independent set of standards for the delivery of streaming multimedia across the Internet. RTSP provides a framework for packet segmentation and streamed delivery of live feeds as well as static files.

RSVP (Resource Reservation Protocol) is a set-up protocol designed to ensure that there is a guaranteed quality of service between client and server. Applications invoke RSVP to request that the connection meets its peak/average bandwidth requirements and delay bounds. The network nodes, which must support the protocol, will then evaluate the request to see whether it is possible and that the client has all the proper permissions, then set aside the requisite bandwidth for the client.

RSVP works well in conjunction with IP multicast (where only one RSVP request needs to be made per device) as well as RTP and its associated protocols.

While this works fine on corporate networks, how it will work on the Internet is still the subject of a great deal of study within the APAN group and other advanced network developers around the world. Obviously, a consistent approach is essential. It seems likely that ISPs will charge a premium for such services, although how this will operate is unclear.

MPEG-4

The possibility of broadcasting video over the Internet is one that drives many companies. Those who have tried have usually come to their senses very quickly, however. The Internet just can't cope — yet. Bandwidth is one problem, although many of the things discussed here go a long way to solving that. Apart from bandwidth, however, we need a new video standard, one that scales according to the network conditions and destination device (which is so often an unknown on the Internet).

In November this year the Moving Pictures Expert Group (MPEG) plans to present to ISO a new specification which should be adopted as an official standard early next year. Called MPEG-4, the standard is not designed exclusively for Internet casting of multimedia, but does address a number of problems associated with it.

The trick to MPEG-4 is the componentisation of the data. The data is broken down into audiovisual objects (AVOs). For instance, in a teleconferencing MPEG-4 stream, the person's head may be one AVO, the background another, and the audio a third. These are then delivered in what are called element streams, as more or less discrete components. Other streams define the composition and synchronisation of the AVOs, so the receiver gets coherent output.

So what's the point? For Internet-based delivery of data in particular, MPEG-4 has a number of key advantages, the main one being support for scalable bandwidth.

Each element stream can have its own quality of service (QoS) indicator, allowing the stream to scale according to the bandwidth of the delivery network. Going back to our teleconferencing example, the voice might have the highest QoS priority, while the video and the background have lower priority.

In essence, what we will have is 'layered' delivery of video and other multimedia services. A video stream might be broken into four layers, with different QoS values. People with low bandwidth may only receive the most important layer, which provides a basic, low-resolution scene. People with higher bandwidth, however, will receive more layers, and have higher resolution, higher-quality video. Such scaling can occur either during transmission or at the decoder. The former is useful for bandwidth-limited networks, the latter when delivering streams to audiences with unknown or varying decoding capacity, such as is the case when broadcasting over the Internet.

The object model of MPEG-4 also allows more niche uses of interactive material. The composition of objects in an MPEG-4 stream can either be determined by the sender or receiver. The location and appearance of different video objects, for instance, might be changed manually by the receiver.

Part of the MPEG-4 standard defines methods of compressing audio and visual objects. Generally, these are similar to earlier MPEG standards (MPEG-2 and MPEG audio layers), as well as borrowing from Apple's QuickTime technology. Additionally, some new features for low-bandwidth synthesis of audio and video are being looked at in lieu of higher-bandwidth, non-synthesised streams. These include text-to-speech, MIDI delivery and synthetic facial animation (Max Headroom style).

While not a panacea, MPEG-4 does offer new opportunities for video delivery over bandwidth-limited networks. Devices for encoding and decoding are already in the works. The only question that remains is: will it take off?

IP over SONET/SDH

Asynchronous transfer mode (ATM) was always a product of its telephone company masters. Originally it was designed to integrate voice, data and video in heterogeneous telco networks. Since it was conceived, however, the Internet has emerged as a more popular option for delivering multimedia. Today's Web may lack the sophistication of pure ATM networks, but it is practical, simple and ubiquitous.

Web standards dominate all discussion of advanced communications. Few developers today consider writing to any standard but IP, so hardly any applications take advantage of ATM's strengths. The result is that ATM has become a plodding workhorse for the Internet — the technology of choice for industrial-strength backbones, but rarely loved for its fine breeding.

Since ATM is little more than a fat pipe in most deployments, astute Internet service providers and emerging telcos are highly sympathetic to technologies that could cut ATM out of the picture and potentially save them expense, complexity and management costs. And because most ISP backbones are fibre-based, the logical step would be to pass IP packets directly through the optical signalling system.

Optical fibre signals are controlled in Australia by a standard known as Synchronous Digital Hierarchy (SDH), although readers may be more familiar with the hyped US equivalent Synchronous Optical Network (SONET). (There are minor differences, but the standards converge from 155Mbps upwards.) SDH defines both datagram framing (Layer 2) and encoding to translate frames into optical signals (Layer 1).

The basic notion behind IP over SDH (better known as Packet over SONET) is to create a direct mapping between IP's Layer 3 functions and Layer 2 SDH framing, thus bypassing the complexity of ATM (which handles encoding, switching and routing at Layer 2). Moreover, IP on SDH removes the 'cell tax' involved in translating IP packets into ATM cells and then into SDH frames — although ATM advocates counter that SDH elements could be removed and ATM cells mapped directly to fibre. Recent proposals go even further, proposing to omit SDH and map IP directly to optical colours for wavelength division multiplexing (see below).

Direct fibre solutions are particularly attractive to network providers focused solely on IP, because for them the extra layer of ATM complexity brings few benefits and costs a pretty packet. SDH, while not as flexible as ATM virtual circuits, can certainly slice up point-to-point bandwidth and provide protective link redundancy — both ideal backbone characteristics.

"If the bulk of your traffic becomes IP, then IP over SDH makes sense to optimise your cost structures, bandwidth utilisation and network management," said Michael Boland, a senior consulting engineer at Cisco. "The more IP in your network core, the more attractive SDH is."

Boland told *APC* that Cisco is working with several Australian ISPs and new telcos which are evaluating SDH Internet backbone solutions, but stopped short of naming names. Telstra, Optus and OzEmail sources agreed direct IP on fibre is attractive, but no firm commitments have been made. Several US telcos are starting out with wholly SONET-based networks, but Boland feels fibre access is much harder here where telcos fear upstart bandwidth resellers.

ATM is unlikely to fade entirely: until we have SDH-capable fibre into every home and office, we'll need ATM's granularity to manage access networks. But in the backbone, ATM could face a chequered future.

Wavelength division multiplexing

If you think Moore's Law is impressive, you ain't seen nothing yet. The Intel founder's observation that microprocessor power doubles every 18 months pales in comparison to the boom in fibre optics. For the past two decades, fibre's carrying capacity has doubled every 12 months — and recently that growth rate started moving even faster.

The world's insatiable lust for bandwidth is driving the optical explosion. Enormous financial rewards await companies that can convert scientific breakthroughs into successful technology products. Three stand-out developments are pushing the limits of photonics, the enlightened science behind fibre optics.

The first came in 1985 when a team led by British academic David Payne uncovered the Holy Grail of photonics: an optical amplifier. Before this breakthrough, fibre lines had to be connected through electronic amplifiers that were error-prone bottlenecks. Later Payne enhanced the amplifier with correction technology that ensures more optical signals can be retransmitted accurately.

Enormous financial rewards await companies that can convert scientific breakthroughs into successful technology products.

The third watershed is wavelength division multiplexing (WDM), a technique that allows separate communications channels to be sent on different colours of light. Pioneering contributions came from numerous researchers, but WDM depends fundamentally on Payne's earlier discovery: without optical amplification, WDM is essentially impossible.

As transmission controls improve, WDM makes fibre capacity virtually limitless. And since fibre optics will underpin all large Internet backbones, WDM could eventually bring the gigabits and terabits of throughput we need to transform today's Internet into tomorrow's information superhighway. Photonic pulling power is so enormous that Payne recently cal-

culated the whole world's Internet traffic could be pumped down one fibre.

Importantly, these revolutionary technologies can be retrofitted to existing fibre infrastructure. Older amplifiers can be replaced with optical ones, and WDM head-end equipment can magnify the bandwidth available through existing fibre ducts. Generally, the cost of retrofitting under-sea cables is prohibitive, but new routes such as the trans-Pacific Southern Cross Cable will take advantage of the latest breakthroughs. Telstra Research Labs is currently evaluating how to introduce WDM into the carrier's voice and data networks.

Beyond the bandwidth boon, WDM opens up potential for what Payne calls optical self-routing. Essentially, this is a routerless network where unique colours are used to denote different backbone paths.

Removing electronics-based network switches would deliver greater bandwidth coupled with light-speed transit times.

One specific colour could denote a Melbourne-Adelaide trunk, while others could represent point-to-point connections to Seattle, London and Hong Kong. Removing electronics-based network switches would deliver greater bandwidth coupled with light-speed transit times.

However, WDM transmitters remain tremendously expensive and sensitive devices with fine-grained laser controls and mirror adjustments. "You need a team of PhDs to make it work," said Payne. "That's clearly unacceptable for optical communications to succeed."

Payne believes the continuing evolution of photonics will encourage bandwidth extravagance in much the same way we take cheap microprocessor power for granted. "We're beginning to be profligate with using bandwidth and that is a fantastic opportunity," he told *APC*. "The essential message here is: bandwidth, we need it, and fibre optics are going to provide it."

Inline caching

Absurd as it may sound, an indirect path can be the fastest route to Web content. The secret behind this assertion is Internet caches — large disks that store frequently downloaded Web pages so they can be reloaded without traversing the whole Net every time. We all use caching to some extent, since by default browsers store recently accessed content on the local hard disk for faster access. So when you visit **apcmag.com** to read about the latest technology, the site's graphic elements are loaded from Netscape's local file store, while any changed content like news headlines will be fetched directly from the server. For even faster results, you could even access a secondary cache called a proxy server that stores the most commonly accessed Web pages for all the users on your ISP.

The trouble with proxy servers is that they require tricky configuration changes within every browser client. What's really needed is a transparent solution — a cache that remains invisible to users and won't take no for an answer. Recognising a market opportunity, Cisco last year introduced a product called the Cisco Cache Engine, a simple appliance that ISP or enterprise network managers can simply plug into their network to deliver caching for all users.

The Cisco device might be called an 'en route cache' since it is intimately linked to the Cisco routers that dominate Internet paths. The Cache Engine hangs off an Ethernet port on the router, which diverts all Web requests using the proprietary Web Cache Control Protocol. The Pentium-powered Cache Engine features a specialised real-time operating system that speed searches the 24G local storage before serving up cached pages or directing uncached requests back to the router for download from the Web.

Up to 32 Cache Engines can be clustered into a cache farm with automatic load balancing and redundancy. A full 32-engine farm could support 28,000 concurrent client sessions accessing 768G of cache storage — enough for approximately 25 million Web pages.

The hefty $34,505 price tag makes this appliance most appealing to ISPs that want to reduce backbone interconnection costs, but as the price drops Cache Engines could start appearing in enterprise networks. The product can be deployed in a hierarchy: for ISPs, this would allow local caching at each POP to reduce internal network load, while corporate IT managers might install a Cache Engine at branch offices to reduce intranet traffic costs.

While Cisco's router dominance is a distinct advantage, the caching market is already hotting up. Network Appliance's NetCache is a similar hardware/software system, although its software can also run on Unix or Windows NT. NetCache grew out of a cooperative Web caching project called Harvest, and a public domain version called Squid helps big ISPs such as Connect reduce international traffic. Unlike Cisco's proprietary protocols, NetCache is based around an IETF standard (RFC-2186) called Inter-Cache Protocol (ICP).

Dynamic content could pose an obstacle for caching, although Network Appliance claims as much as 70% of Web traffic consists of graphics and software updates that can be easily cached. Still, sceptics question whether improved network performance justifies ISPs disturbing end-to-end integrity.

"The key question here is whether it is OK to alter the technical semantics of the packet header in the efforts to create a more competitively priced product," said Internet Society secretary Geoff Huston. "Is it 'better' for the post office to generate answers to your letters locally, as the locally generated answer is cheaper than delivering your letter and delivering the response back?"■

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Just how will a virtual trip to the casino work? **By Josh Gliddon**

Trying your luck online

Online gambling and ecommerce have a lot in common. Understanding the way an online gambling system works therefore entails an understanding of an ecommerce system, as well as an understanding of how the 'face' of the gambling system (the game itself, whether it be blackjack, poker, roulette or two-up) relates to its ecommerce underpinnings.

There are a number of ecommerce/online gambling implementations available. To function, the system requires — from the client end through to the back end — a browser running on a personal computer, a connection to the Internet, a gambling service provider, the gambling application and an ecommerce engine.

The client end is a simple affair: all that's required is a browser, which it's convenient to think of as a universal client providing access to the Internet. This client then needs to run on a device that can be connected to the Internet.

The client device doesn't need to be smart because the Internet isn't difficult to access; unlike calculating spreadsheets or rendering 3D animation, it doesn't require a lot of processing power. The real work happens along the way at the routers that tell the IP packets which way to go, or at the server end, where the requests for Internet pages, or ecommerce services, are processed. The client only needs to run a basic communications stack, and have the ability to run a gambling game written in Java or some other portable language and perhaps have some multimedia capabilities.

Java is likely to be the number one contender for the delivery of Internet gambling because it's a cross-platform, portable language that's able to run on any machine incorporating a Java virtual machine (JVM). The JVM is a 'software computer' that is able to interpret the Java language commands and communicate those commands to the operating system.

At the moment, a reasonable amount of power is needed to run the JVM that processes the Java applets. This in turn is why most Net access currently occurs via PC. This should change over the next decade as manufacturers of set-top boxes build the ability to access the Net and render portable languages like Java into their products.

Why Java?

Java has been pretty slow to break into the mainstream. Reasons for this lack of acceptance include the poor performance of the VMs used by PCs to render Java applications, the time it takes to download Java applications to the client over existing Internet links, and the relative immaturity of the Java language itself. This immaturity has meant that businesses have been hesitant to adopt it because of the perceived potential for security breaches.

Balancing these concerns is the commitment of big names like IBM, which has over 2,000 developers working specifically on Java development; Sun, which of course invented Java; and Novell, which is putting Java at the very heart of the latest release of its NetWare network operating system.

Novell's international vice-president of marketing, John Slitz, says that Java is a "sleeper" and that most of the development has been going on behind closed corporate doors. "Java's going to be very important," said Slitz. "Java will provide the key to heterogeneous platforms and applications."

For this reason Java is in pole position for the provision of gambling over the Internet: the client machine doesn't need to be a Windows PC or a Mac because Java is a cross-platform language. If the device can run a JVM and connect to the Internet, it will be possible to use it as a gambling client. For the providers of gambling services, the greater the reach of the Internet, the greater the number of potential players. The greater the number of players, the larger the profits.

The provider end

There are other methods apart from Java that can be used to provide gambling over the Internet. The NSW TAB, for example, offers punters the ability to bet online on horse and greyhound races, the trots and football. It's important to make the distinction between what the TAB is doing

and what can be termed 'true' online gambling.

In a true online gambling scenario, the game operates in a virtual arena. If a gambling operator were offering to take bets on an online version of roulette, for example, then that roulette wheel would exist purely within the virtual realm, generally as a Java applet running on the client machine. A random number generator on the server would perform the actual 'spinning' of the roulette wheel, while the Java applet would simply be used to display the outcome. The spinning of the roulette wheel is not a relayed or Netcast version of an actual roulette wheel being spun in a casino or gaming room somewhere.

The NSW TAB's system differs from this in that it involves taking bets on *real* races occurring at *real* racetracks, and is therefore subject to all the normal racing checks and balances. Taking Internet bets in this way is far simpler than conducting the entire race virtually, as only the veracity of the person placing the bet needs to be established. To do this, the NSW TAB implemented a digital certificate solution, which involves the punter providing identification to the TAB, much as they would if they were obtaining a PIN (personal identification number) for a phone betting account. The digital certificate acts in much the same way as the PIN, residing on the client computer and asking the bettor to provide a PIN when their computer logs onto the TAB system. Once the identity is verified, the bettor can cast bets by entering figures into a Web-based interface much as they would if they were in a TAB shopfront.

NSW TAB technical staff developed the system inhouse, partly for cost reasons, and also because the necessary skills were already on hand. The primary wagering software is a mainframe-based application also developed inhouse. It links all NSW TAB outlets, ensuring real-time wagering takes place. In a sense, the online betting facet of the operation simply piggybacks onto the existing system for taking bets.

Mediating between the mainframe and the distributed bank of Web servers used to communicate with the clients is custom middleware, again developed inhouse by TAB technical staff. The wagering application run on the Web servers is also custom developed, mainly using C++ and CGI (common gateway interface) scripts to pass information back and forth from the Web server to the gambling application.

What the NSW TAB operation does have in common with 'true' Internet gambling is the use of Web servers to mediate

contact between incoming requests for 'transactions' from the client end, and the use of a large back-end system to handle the transaction itself.

In a true online gambling scenario the Web server processes the request from the bettor's computer to take part in a game. The bettor would typically need to provide some sort of identification, such as a digital certificate, before being allowed to play. The Web server would pass the request for verification to an ecommerce back end — such as Open Market's Transact, Access Systems' ANSA Ecommerce Suite, Microsoft's SiteServer Commerce edition, Netscape's Enterprise Server, Net.Commerce from IBM or one of many others — which approves or disapproves the request based on the veracity of the certificate.

The back end would then authorise the game download to the bettor. When the bettor played the game, what they would be doing is sending a request to the ecommerce back end to perform a process (play a game) and return the results to the client.

The ecommerce back end, regardless of vendor, treats a game like a normal transaction; in this case, however, physical goods aren't being ordered or delivered. When a roulette wheel is spun at the client end it triggers a process at the back end which runs a roulette application. The method by which this process is triggered depends on the vendor of the gambling system, as does the way in which the gaming application communicates with the back-end system.

This application then returns a 'win' or 'lose' result, which is registered by the ecommerce back end simply as a credit or debit transaction. Products such as those mentioned above are able to automatically verify credit cards with credit card verification authorities via ecommerce clearing houses such as those run by OzEmail/Camtech and Telstra, as part of its SureLink site. With this infrastructure in place, online gambling becomes easy, in theory.

What are the problems?

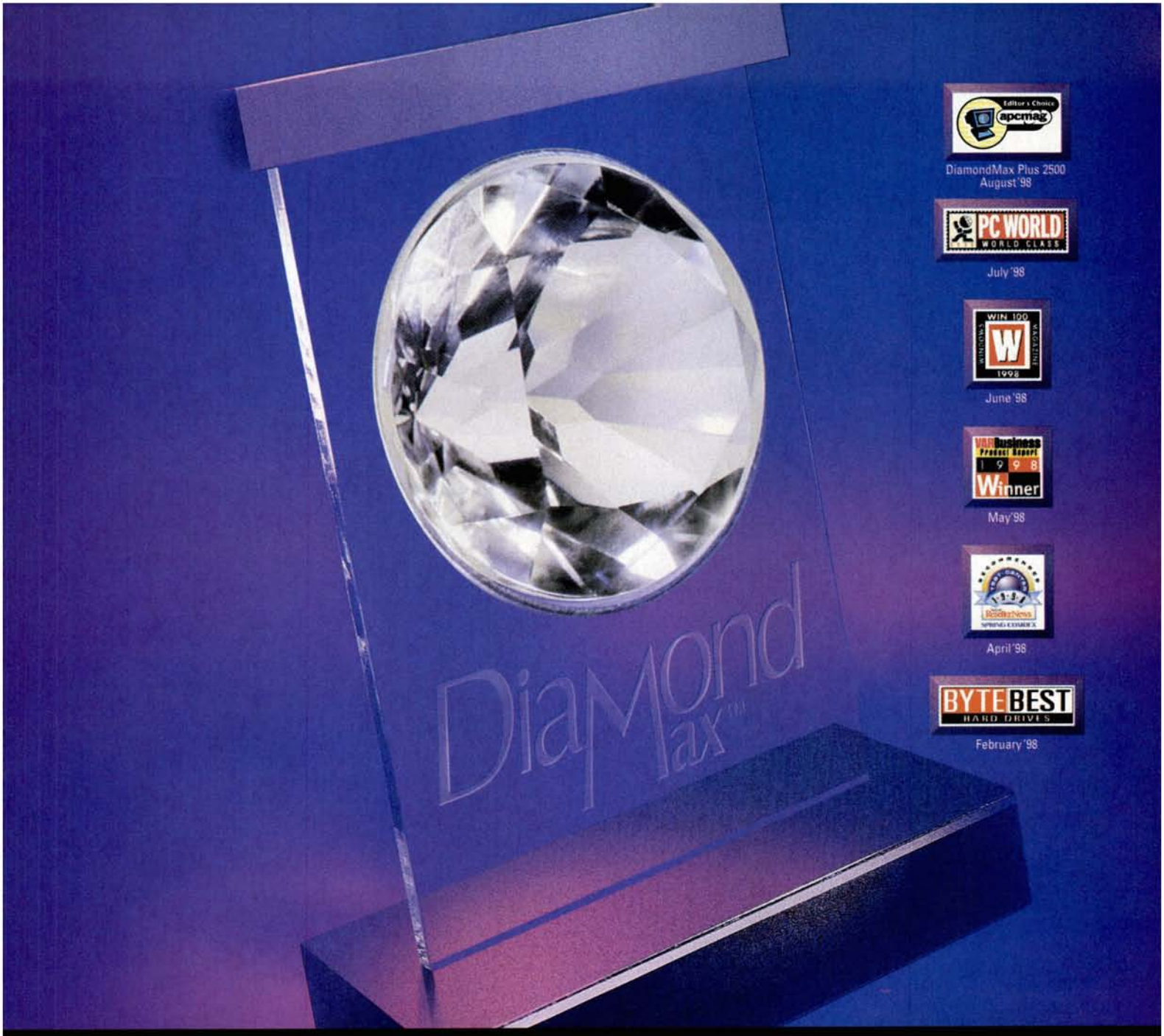
All of the necessary technology associated with online gambling already exists. The real problems lie with government legislation and the need for a larger number of digital certificate issuing authorities, as well as problems with the perception among gambling providers that the PC may not be the best way to provide an online gambling service. Ecommerce, unlike online gambling, already protects consumers from unscrupulous operators under existing laws. Consumers have no protection when it comes to ecommerce vendors outside Australia, which are not subject to Australian law.

Queensland and the Northern Territory are the only Australian states to have enacted laws relating to online gambling. Queensland's Interactive Gambling (Player Protection) Act, enacted earlier this year, means online gamblers can set betting limits for single games or on an ongoing basis. Relatives of problem gamblers can have them banned from online gambling if it is shown to be having a negative effect on them. The Northern Territory's legislation is less exacting and was primarily designed to permit gambling operators to offer interactive gambling.

Queensland gambling supplier Golden Casket has conducted trials of online gambling. Technical manager Brian Cooke said PCs may not be the best way to implement online gambling. "There are a number of technologies on the horizon that promise more than the PC, particularly in terms of interactivity and the social aspects of gambling," Cooke said. "WebTV and cable are the most prominent of these."

Before online gambling can be fully accepted by Australians, operators also need to overcome the perception that the Internet is not secure. Digital certificates will help, but their availability has been limited. No general-purpose authority yet exists in Australia, and despite rumours that Telstra is investigating setting up such a service, and that a digital certificate service has been offered by Australia Post in Victoria only, neither organisation would discuss the issue with *APC*.

Until these problems are solved and the perception that the Internet is insecure has been defeated, most Australians are still going to have to go to the track, or hit the phones, if they want to have a flutter.■



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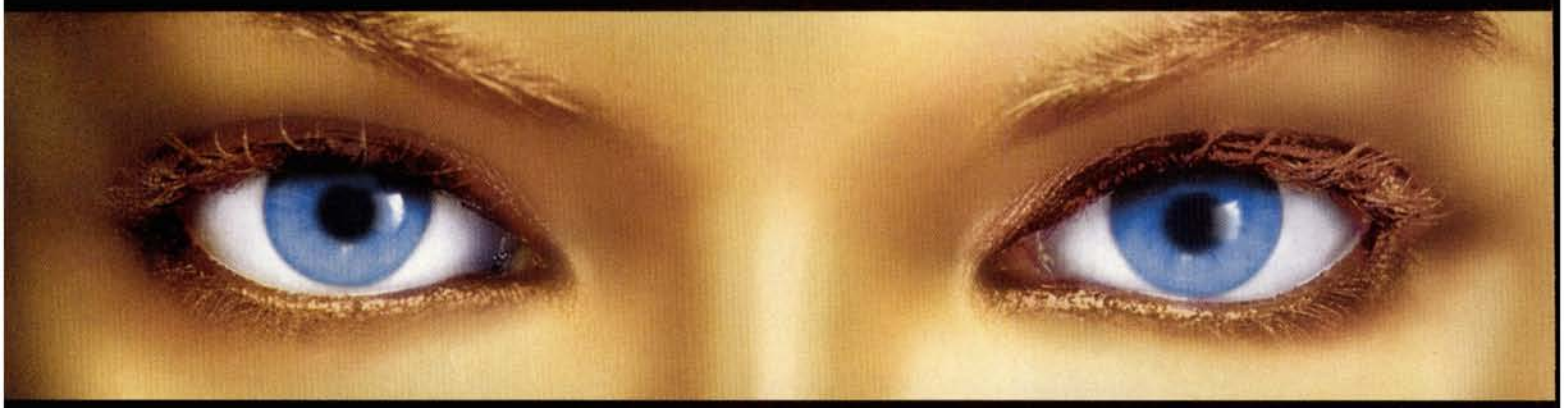

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Good news for ISP consumers — market pressure is cleaning up this town. **By Josh Mehlman**

How the West will be won

There is much debate between market researchers about the current number of Internet users in Australia; figures anywhere between 900,000 and 4.5 million are thrown around. The Internet may never reach the ubiquity of television or radio, but the number of Internet users is still growing, and is expected to continue growing in the next few years. With over 500 ISPs currently serving this market, it is virtually impossible for many Internet users to make an informed decision on which ISP best suits their needs.

While the Wild West metaphor has been overused, it's true that the ISP market has had its fair share of cowboys. Many ISPs have made quick profits providing poor service or charging outrageous prices. The good news for consumers is that the opportunities for a quick buck are diminishing, and the Internet market is overdue for a shakeout. Anyone trying to enter the ISP market now in hope of making a quick fortune is in for a nasty surprise.

Turning point

According to market research group IDC, the number of ISPs in Australia is about to peak, and should begin to head down to more reasonable numbers in the next few years. While revenues are constantly increasing, says IDC, profitability is on the way down and many smaller ISPs will not be able to compete. Internet pricing has been largely arbitrary in the past, but there is now increasing competition between ISPs on price. Larger ISPs are now offering a wide variety of pricing plans, and all-you-can-eat pricing is back, with many ISPs now providing accounts with unlimited or virtually unlimited access. Larger ISPs may be able to cope with lower profit margins in order to gain long-term market share, but this may lead to many smaller ISPs closing their doors as they are priced out.

IDC also notes that larger ISPs are becoming larger, through buyouts and formal integration between ISPs and their various channel partners. The use of mainstream media to advertise Internet services has become more commonplace in the past year. Big Pond, OzEmail and One.Net especially have made use of the media, showing ads in cinema, newspapers, mainstream magazines, on TV, and even on buses and taxis. This gives larger ISPs a much greater advantage in gaining new customers, especially first-time users. Smaller ISPs can't afford a high level of media coverage, but without it, signing up new customers will become increasingly difficult.

As profitability declines in dial-up Internet access, IDC predicts ISPs will be looking to other Internet services to provide revenue. Web site hosting and development, ecommerce, security and Internet telephony and fax are set to be the new growth areas. However, ISPs are likely to find tough competition in these areas as well, with companies such as Domains N Servers and Hotspace dedicated to providing Web hosting solutions, and numerous other competitors in all these new fields. On page 122, Dan Tebbutt discusses some of these new services and the impact they're likely to have on the ISP market.

Internet serviced poorly

ISP customer service still has a strong Wild West feel to it. When the Internet was the domain of tech-savvy geeks, it seemed acceptable for ISPs to skimp on technical support, to have poor account-keeping systems, to have poor performance and to overcharge for it. Even though the demographic of Internet users has changed markedly, some ISPs are still not providing an adequate level of customer service; failure to deal with service complaints is one of the main reasons our readers gave for changing ISPs. While almost all ISPs now provide technical support through phone, email and other methods, some feel it is appropriate to charge a fee for this support, and some use 1900 phone numbers, which cost up to $2 per minute. As Internet users become more experienced and more demanding, customer service will be an increasingly important point of competition. Roulla Yiacoumi takes a look at the results of our recent ISP Service & Reliability survey on page 140.

Aside from customers demanding good service, the government is also getting in on the act. The Telecommunications Act 1997 sets the Telecommunications Industry Ombudsman (TIO) as a sheriff over ISPs to keep the cowboys and outlaws in line. ISPs are required by law to register with the TIO — although several major ISPs have not yet done so — and the TIO acts as an independent arbitrator when customers feel their service problems have not been resolved satisfactorily.

How does all this affect me?

The major question is how all these changes are going to affect end users. While the number of ISPs is on the way down, it appears competition is on the way up, and that can only be good for the average customer. These changes will most benefit larger ISPs, but some smaller ISPs will also prosper by serving niche markets. Competition on price means not only cheaper access, but also a wider variety of payment options to better suit your needs. And competition on service means better customer service, when ISPs realise that the best way to keep a customer is to keep them happy.

Access One

Access One is still operating as a consumer dial-up service, despite the merger of its business service with OzEmail's, following OzEmail's takeover of Access One earlier this year. But with the same pricing schemes as OzEmail, access in most of the same places OzEmail is available, currently no 56K dial-up access and operating from the same network as OzEmail, there seems to be no obvious reason to choose Access One instead of OzEmail.

That is, until you look at our test results. Although Access One's average connect speed was a bit below 33.6K, it outperformed OzEmail in FTP times, gaining above-average results. And while connect speeds may not always be optimal, you should have no trouble getting connected, with only two out of 100 failed connection attempts. Other performance indicators were also good. Ping response was quick, and packet loss was low to Australian sites, although the connection to US sites was not as impressive.

With strong online performance and a wide range of pricing plans, Access One is a good option. In the next few months, Access One will be installing V.90 56K

modems in all its POPs. While Access One's prices match OzEmail's dollar for dollar, Access One is not offering the all-you-can-eat plan, so Internet junkies will have to look elsewhere.

Josh Mehlman

Phone	1800 818 391
Online	http://www.aone.net.au/
Services	Web hosting, site management, network integration, consulting, ecommerce, firewalls, VPNs
In short	Not the cheapest, but very good performance makes this a really good choice.

CompuServe Pacific

One of the oldest players in the ISP market, CompuServe is still a favourite with global travellers because of its extensive international network of POPs. Recent financial difficulties, and the resulting rationalisation of its POPs, have dampened CompuServe's appeal somewhat, as has the availability of global services from other ISPs.

CompuServe remains an expensive proposition for casual Internet users; charges range from $14.50 for two hours per month to $99 for 40 hours per month. This includes standard Internet access from any of the worldwide POPs, as well as access to CompuServe's proprietary forums (which require special software to access).

CompuServe supports x2 and V.90 connections in Sydney (only) for people want-

ing to surf at 56K, but unfortunately, modems meeting these standards were not available to us at the time of testing. As a result, we have only listed 33.6K results for CompuServe, which should give an indication of its overall performance.

The performance and availability of CompuServe Pacific was poor, with extremely slow ping response times (especially within Australia) and average FTP download times. Worst of all, CompuServe had 19 failed connects, the most of any ISP tested at 33.6Kbps. This stood in stark contrast to CompuServe's stated 'no busy signal' policy.

In spite of all of this, CompuServe remains a good choice for the frequent traveller, simply because it has POPs in so many international locations — including 10 within Australia. If it plans on picking up stationary home and business users, however, it needs to work on its performance and price.

Nathan Taylor

Phone	1300 555 520
Online	http://www.compuserve.com.au/
Services	Web hosting, site management, network integration, consulting, VPNs
In short	Expensive and slow, but has an extensive network of POPs.

Connect

Connect's pricing plan is fair compared with the other ISPs in this review, especially for home users who may find themselves switching ISPs once their Internet use increases. However, Connect (formerly Enternet) has more palatable pricing for permanent business connections. Its standard pricing structure involves no set-up costs and only $40 per month with 21 hours' access.

In terms of performance, Connect ranked within the top half of all of our tests, but was most impressive in the ping tests for both 33.6K and 56K connections for both local and US sites. The speed of the 33.6K ping responses was faster than when we last checked in May, but in some cases the amount of lost packets has also increased markedly.

When you consider the extremely fast FTP results for both connection speeds and the fact that Connect has a well-established, high-quality Australian backbone with stable US connections, it still represents good value for money. Unfortunately, many people would be put off by the high rate of failed connections; we experienced nine busy signals at 33.6K and 15 at 56K.

Connect has such a solid backbone that it not only runs its own service, but serves as the backbone for many other Australian ISPs which run their services from it. If that doesn't give you the assurance you need, Connect also maintains a

technical support line from 8am to midnight from Monday to Saturday and from noon to midnight on Sundays and public holidays. Connect has POPs in all of the capital cities except for Darwin and Perth.

Darren Ellis

Phone	1800 818 262
Online	http://www.connect.com.au/
Services	Web hosting, site management, consulting
In short	Solid, stable and fast ISP.

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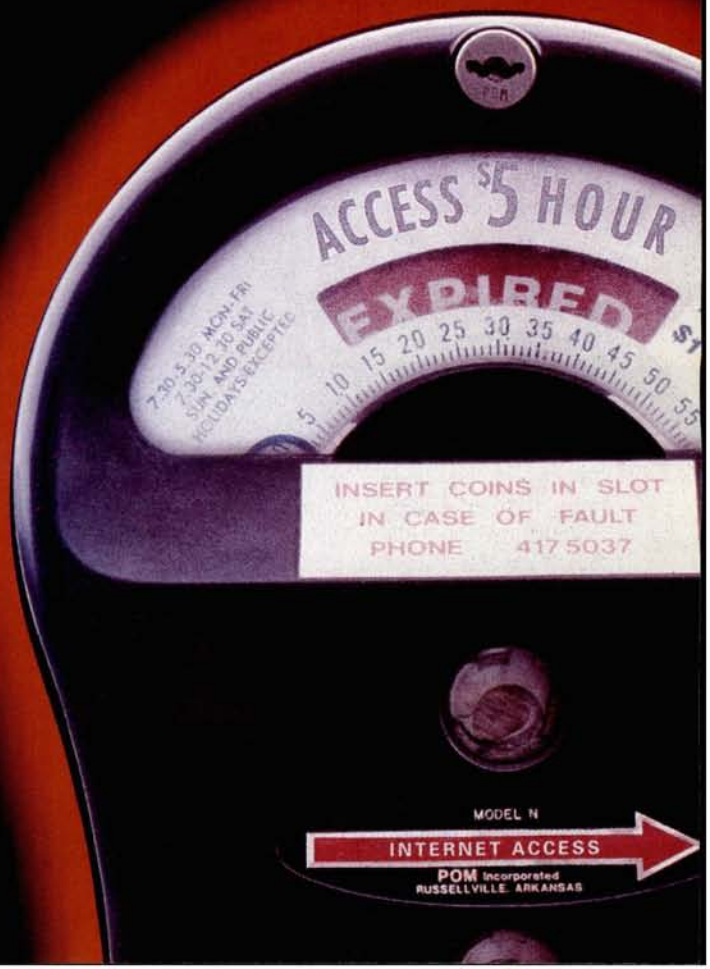

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http://www.netspace.net.au
e-mail: info@netspace.net.au

DIALix

Founded in 1989 as a dial-up Unix service, DIALix is one of the oldest Australian ISPs. Though it hasn't expanded at the rate of competitors like OzEmail, DIALix has plenty of loyal customers and offers a few things the others don't.

If you want to learn Unix or just use a good old-fashioned shell (command line) account, take a close look at this provider — DIALix's shell has been finetuned over many years and has good help resources, although its main business is in standard PPP connections. Online tech support services are good, but you'll want to avoid using the phone — this costs an outrageous $2 per minute.

The basic DIALix access plan is $40 a month for 50 hours, or unlimited hours at major POPs. Customers online for over two hours are eligible to be disconnected if modem demand outstrips supply. Dedicated modem connections are available and there are some lower-volume pricing options, while Web hosting is offered at the unusual price of one cent per 10K of data.

DIALix's Sydney POP held a perfect record of successful connections in 33.6K testing — no engaged lines or flakey terminal servers here, but our average connect speed was just 32,016bps. Ping test results were about 100ms too slow across the board, and the 9.6% packet loss to the US would probably hamper activities like audio streaming or online gameplay. To an extent, low packet loss to Australian sites made up for this, and our ping and trace tests all completed in good time.

DIALix averaged a respectable 181.1 seconds to transfer the US file, and a reasonable 150.7 seconds for the Australian one. Puzzlingly, the Australian FTP test died eight times, while the US transfer only hit trouble three times.

As with all ISPs, performance may vary at other POPs. This may be a bigger consideration with DIALix, however, as it's now a franchised operation. Other access points are run on an almost identical basis, but may be owned by a different set of people.

Simon Vandore

Phone	(02) 9972 9357
Online	http://www.dialix.com.au/
Services	Web hosting
In short	There are plenty of good points to this well-established ISP, but neither performance nor pricing stand out.

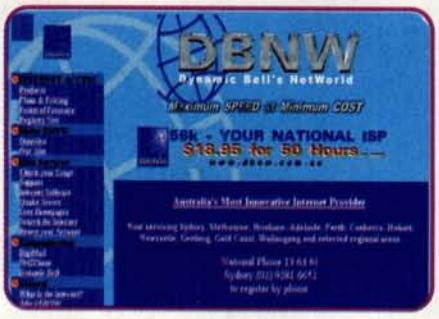
Dynamic Bell's NetWorld

While Dynamic Bell has provided telephony services to the Australian market for the past seven years, this is the company's first foray into the Web business. Dynamic Bell's NetWorld (DBNW) was established in January this year, and makes its first appearance in this round of *APC* ISP reviews.

DBNW offers a bargain-basement plan of just $18.95 per month for 50 hours, 5M of Web space, and seven-days-a-week technical support — this is probably the most attractive plan of all the ISPs reviewed here. (There is a $25 set-up fee and additional hours incur a charge of just $1.95.) An annual plan costing $189.50 for 50 hours per month also sounds attractive, but *APC* would like to warn against paying an annual fee to a new ISP.

Considering the surprisingly cheap plan, DBNW's performance wasn't too bad. It even managed some very impressive results in the low number of failed FTP retrievals to both our Australian and US sites. Its FTP times, however, weren't as fast as some other ISPs.

You may need to dial a few times to get through. We experienced 14 failed connects on the 33.6K lines and 12 on the 56K lines. However, considering the low cost, this isn't too much of an inconvenience. It remains to be seen whether DBNW will go down the path of fellow bargain-basement ISP One.Net and, at a later stage, introduce a fee for technical support.



One final note: users of inexpensive plans would do well to read the fine print in the terms and conditions and make sure these are acceptable *before* signing up. For example, in agreeing to the terms and conditions of joining DBNW, customers acknowledge that there may be congestion, and that users "may have to be disconnected" to ease this congestion. Don't say you weren't warned.

Roulla Yiacoumi

Phone	(02) 9281 6652
Online	http://www.dbnw.com.au/
Services	Web hosting, site management, network integration, consulting, digimail, remote email access, Internet telephony
In short	A new player in the ISP market that is cheap and offers not-too-bad performance.

Editor's Choice apcmag

EDITOR'S CHOICE

• Telstra Big Pond Home

Excellent performance and stable connections, an attractive array of different pricing plans (including $44 for 150 hours) and fantastic technical support hours elevated Telstra Big Pond Home to Editor's Choice status.

There were a few other ISPs we liked, but none of them enough to warrant awarding our runners-up Highly Commended accolade. OzEmail's $45 unlimited access monthly account drew our eye but its performance was not as impressive as that of Big Pond. On the performance front, we liked Connect but could not accept the high failed connects nor the high fees for high-volume Net users.

The '$18.95 for 50 hours' plan from Dynamic Bell's NetWorld (DBNW) certainly sounded attractive (with additional hours at $1.95), but this ISP hasn't been around long enough for us to pass judgement. Plus, performance was mediocre and we encountered a large number of busy signals during testing. For the budget user willing to accept these inconveniences, DBNW may be a better alternative than what's currently on offer in this price bracket.

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In addition, you access content and interact with members of the other AOL global services simply by clicking on the International channel, whether it be in the USA, Canada, Germany, UK or maybe even France.

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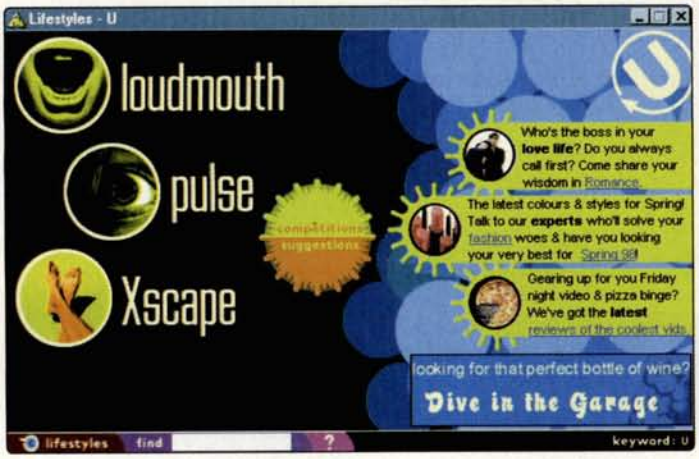

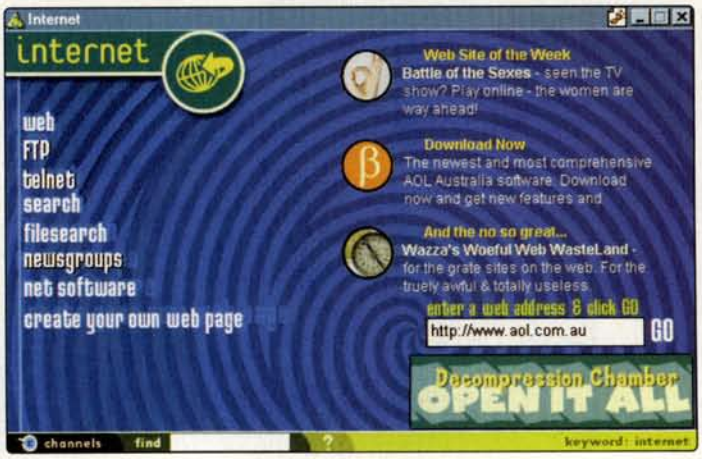

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Parental Controls make AOL parent and child-friendly. AOL offers a safe and secure family environment in it's online areas and in addition, it gives parents powerful yet easy to use tools for controlling the online environment for children. Not only this, but AOL has it's own set of 'Rules of the Road' or terms of service, which members must follow while online.

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KEYWORD: AOL TOUR
KEYWORD: INTERNATIONAL

2 AOL brings you the latest in Internet technology. Check out AOL's powerful new search engine AOL NetFind™ - the easiest, most comprehensive way to find what you are looking for - fast!

Whether you're looking for sound files & graphics or Web sites, AOL NetFind™ can help you find it. And with Microsoft Internet Explorer 4.0 as your integrated Web browser, it's easy to explore the web for all your information needs.

KEYWORD: INTERNET

3 AOL keeps you in touch around Australia and around the World. With AOL it's easy to send and receive email with your own personal touch! Plus every AOL account comes with 5separate email addresses - one for each member of the family.Get creative - choose from a huge range of background & text COLOURS - use BOLD or *Italics* - Send your family, friends or associates notes, files, hyperlinks to a website or even your own photo - it's easy.

Send an instant message to all your friends online by setting up your Buddy List™ - a bit like an interactive post-it-note.

KEYWORD: EMAIL

4 AOL brings you News & Sports - the moment it happens

NEWS: Check out the News channel and you'll find the latest headlines and in-depth articles of Local, National and World importance. There are web links to online newspapers from around the world, from New York to London or Australia just to name a few.

SPORTS: Get the news on Sports, enjoy game highlights and player profiles complete with photos, rumours and competitions. You can even chat with your favourite International sports stars that feature on AOL Live!

KEYWORD:NEWS
KEYWORD: SPORTS

5 AOL Online Fun & Fact for the Family

Fun: AOL's Entertainment channel lets you tap into the latest Hollywood gossip, movie reviews and lets you keep in touch with the latest arts & entertainment listings each week.

Facts: AOL is dedicated to bringing you & your children a world of education & learning. There's online study notes, homework help and carefully selected Kids Internet sites.

KEYWORD: ENTERTAINMENT
KEYWORD: LEARNING

6 Globetrotting on AOL

Going on a holiday? Don't leave home without checking AOL for all your travel essentials. Whether it's flight times & foreign exchange, or travel guides & tourist information - you'll find it all at AOL's Travel Channels both in Australia & around the world.

KEYWORD: TRAVEL

7 AOL keywords for quick access

Click on "Find" on the menu bar for a quick and easy way of accessing areas on AOL. It works like an index tab, allowing you to go straight to an area, rather than navigating by using the menus and subscreens. Simply type in the AOL Keyword press enter - and you're there.

KEYWORD: KEYWORDS

8 AOL lets you rest easy with Parental Controls for your family's added security. Worried about what your kids might be able to access? Rest assured this will be completely within your control on AOL.

- Set your own limits for which AOL and Internet areas your kids have access to - you can block various types of access to the Net, such as downloads from Newsgroups, Chat rooms, or you can block all Internet access, so that kids can play safely.
- All kid's Chat areas are also chaperoned by AOL 'guides'.

KEYWORD: PARENTAL CONTROLS

9 AOL helps you build your own website

With your AOL account you are given a generous 10Mb of Web space, so why not create your own personalised Web site - AOL even provides online tools to help you with this! Enter your own text, provide your own links, include your favourite sounds or other multimedia files and even a picture of yourself!

KEYWORD: MY PLACE
KEYWORD: AOL PRESS

10 Get A Life. Cliques and Communities - everything from teenagers to Grandparents. There's International Forums, Women's Forums, a Writers Group and a Gay & Lesbian area. These are just some of the areas where you can chat to like minded people from around the world on topics that are of interest to you. Great new friends are now just a mouseclick away!

Your free trial must be used within one calendar month of your initial sign-on. Free trial does not include telephone connection charges. The pricing plan is outlined online. Access to AOL requires a credit card. To use AOL you must have a 486 PC or higher, 16MB of RAM, 25MB of HD, a VGA monitor (256 colour support recommended), a mouse, a modem, a CD ROM and a copy of Windows 95 or 98. You must be 18 years or older. Limit of one free trial per household. Offer only available in Australia. Free trial must be used by 1/4/99. Access to and usage of AOL is subject to terms and conditions, which are available, online.

AOL Bertelsmann Online Services is located at Level 5, Tower A, Zenith Centre, 821 Pacific Hwy, Chatswood NSW 2067

AOL-DP00001

EISA

EISA has a strong Australian Internet backbone which runs from the major cities using Optus's infrastructure. EISA only has six POPs at the moment (in Adelaide, Brisbane, Hobart, Melbourne, Perth and Sydney) but is expecting to deploy more, including rural access points. Internationally EISA is linked via Optus, PanAmSat and IBM Global Network.

At the moment, it does not have 56K connectivity, but that should happen in the near future. We suffered 16 failed connects, which was the third worst rate. Interestingly, EISA's US connection was more reliable than its Australian counterpart in some tests.

For ping packet loss for two of the Australian sites, EISA lost the most packets of all the ISPs, including a whopping 18% on one. For the US site it still lost 7.8%, but that only placed it in the middle of the field. EISA made up for it with the FTP transfer times, however, coming not far behind the number one ISP for the US site and roughly average for the Australian sites.

EISA informed us that it was having trouble with its frame relay link to Optus during the first few days of testing, so this should be taken into account when considering the test results.

Aside from dial-up connection rate packages, EISA has ISDN and other business services. The most basic deal is the Discovery package which costs $19.95 a month ($199 per annum) with 20 hours' access. The most advanced is the Flat Fee package which costs $39.95 per month ($399 per annum) and has no access or download limits. For any of these there is a one-off connection fee of $25, but they all come with 5M of Web space.

Darren Ellis

Phone	1300 300 928
Online	http://www.eisa.net.au/
Services	Web hosting, site management, network integration, consulting, Virtual ISP program, telehousing
In short	Great pricing, but quality needs improving; will be great when 56K comes online.

Geko Internet

Geko has invested in some bandwidth through Telstra and Connect since our last review in May. In that review, Geko had unacceptable ping packet losses, ping response times and FTP times, indicating that too much demand was being placed on its equipment.

This time round, Geko's results were much more impressive, showing good ping response times and acceptable levels of packet loss to Australian sites. Geko's international connection still needs some work, and produced worse than average ping packet loss for the US site. FTP speeds were particularly slow to the US, resulting in a high level of unsuccessful FTP transfers. This would indicate a slow and not very reliable connection to overseas sites. At least you won't hear a busy signal, except perhaps during peak times, judging by the five failed connects at 33.6K and four at 56K.

Although most of Geko's pricing plans

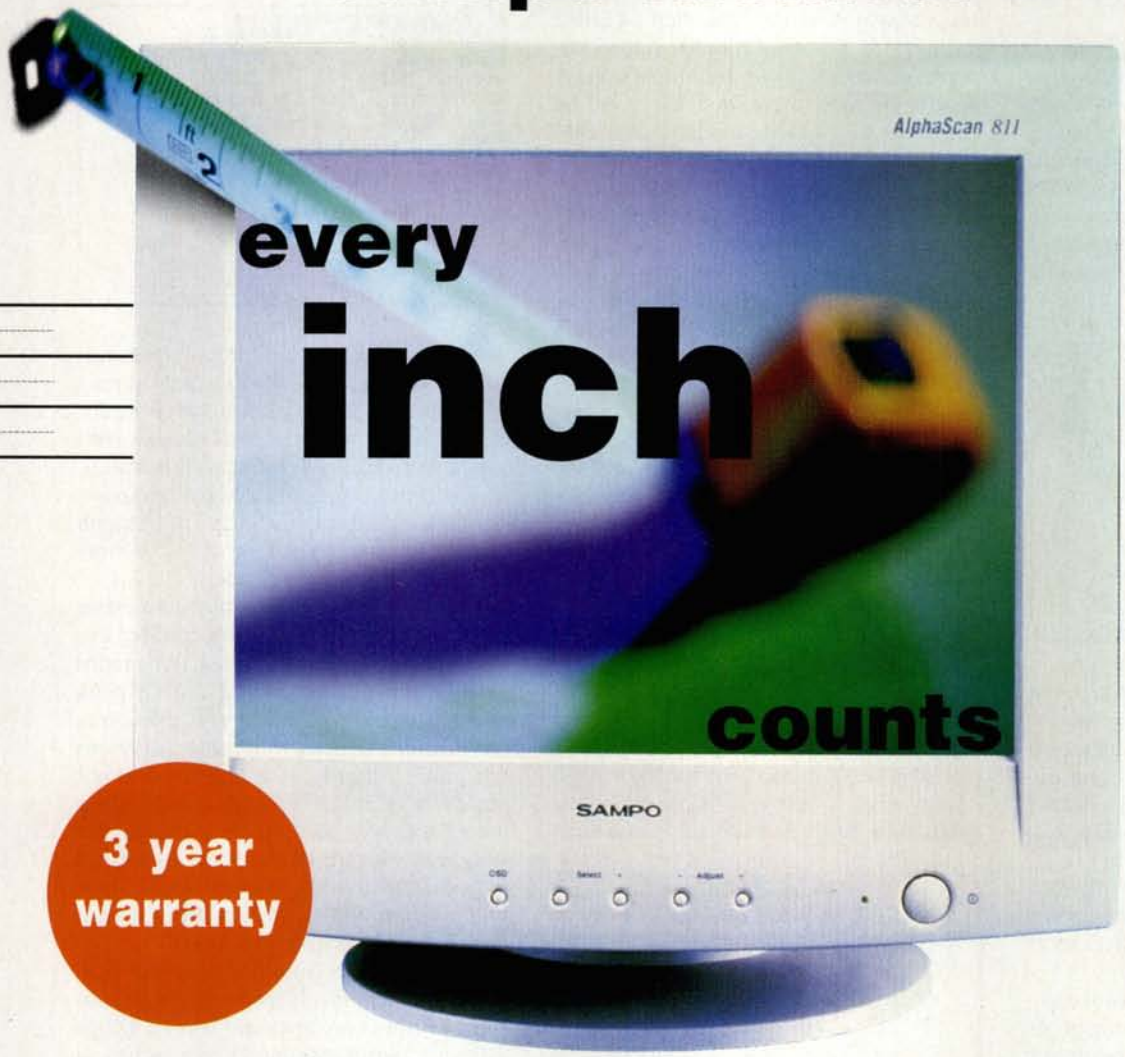
seem a tad overpriced, its $40-per-month plan gives you 150 hours of online time, limited to three hours at a time. It will also start to cost you extra if you download more than 100M a month, but unless you're downloading lots of software or other files, you will probably never come anywhere this limit.

Some plans also have a $5-per-problem fee for technical support, but according to Geko, this is only for the plans aimed at experienced users such as the 150-hour plan, which seems perfect for dedicated Net heads who spend large amounts of time online.

Josh Mehlman

Phone	(02) 9439 1999
Online	http://www.geko.net.au/
Services	Web hosting, site management, network integration, consulting, domain name registration, online gaming
In short	A good choice for Internet addicts; has a great pricing plan and performance that is improving.

with a Sampo monitor



3 year warranty

With larger diagonal viewable areas, Sampo Monitors give you a fuller image. Open up to a world of colour and clarity and experience the benefits of a Sampo Monitor.

Specifications	14"	15"	17"	19"	21"	29"(Full Square CRT)	34"(Full Square CRT)
Model Number	KM 411	KM511Z/SDL	KM711	KM811	KM 950	SM-72D2	SME-23D3
Screen Size	13"	14"/14"	16"	18"	20"	27"	32"
Dot Pitch	0.28mm	0.28mm/0.28mm	0.28mm	0.26mm	0.28mm/0.25mm	0.74mm	0.80mm
Max. Resolution	1024x768	1024 x 768/1280 x 1024	1280 x 1024	1600 x 1200	1600 x 1200	1024 x 768	1024 x 768
Horizontal Frequency	30-54 Khz	30-58 Khz/30-70 Khz	30-70 Khz	30-95 Khz	30-95 Khz	31-38 Khz	31-48 Khz
Regulatory Compliance	UL, CSA, DHHS, TUV/GS, CE FCC-B, MR-II (Opt.)	UL, CSA, DHHS, TUV/GS, CE FCC-B, MR-II (Opt.)	UL, CSA, DHHS, TUV/GS, CE FCC-B, MR-II (Opt.)	UL, CSA, DHHS, TUV/GS, CE FCC-B	UL, CSA, DHHS, TUV/GS, CE FCC-B, EN-61000-3-2 Class-D (Opt.)	UL, CSA, DHHS, TUV/GS, CE	UL, CSA, DHHS, TUV/GS, CE
Warranty	3	3	3	3	3	1	1
Audio						12W +12W	12W +12W
Video Signal						NTSC/PAL, S-Viseo Composite	NTSC/PAL, S-Viseo Composite

KM-511
15" Monitor

- 1024 x 768 Max Resolution
- 0.28mm Dot Pitch

KM-711
17" Monitor

- 1280 x 1024 Max Resolution
- 0.28mm Dot Pitch

KM-811
19" Monitor

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- 0.26mm Dot Pitch

PD-50F

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GigaNet

GigaNet did not perform well in our last ISP review, and it seems that things haven't improved since then. Its number of POPs has dropped by six, but that still leaves an impressive array of 19 POPs across Australia, so chances are you're near a provider. Unfortunately, you stand an equal chance of being disappointed by the connection quality.

GigaNet's connection lost the most packets in the 33.6K ping response tests for both the US site and two of the Australian sites. The fastest Australian ping response times were still well below average, but for the US they rated above average. The failure rate of FTP retrievals was rather high, and when they did succeed in FTPing from the US they scored the slowest times by far (almost one-and-a-half times slower than the next slowest ISP, Switch).

GigaNet's pricing plan involves a flat set-up fee of $30, followed by a range of monthly fees. The hours of free usage are not too generous, but unfortunately the charges for every hour thereafter certainly are — ranging from $3.80 upwards to $5. Each plan comes with 5M of space for Web sites.

GigaNet is not just an ISP, however. It offers a wide range of communication services, including SMS (Short Message Service), training, advertising, technical consultancy and the redirection of incoming email to either your fax or pager.

Darren Ellis

■ Phone	1800 686 889
■ Online	http://www.giga.net.au/
■ Services	Web hosting, site management, consulting
■ In short	Great range of services, but poor pricing and quality.

IBM Internet Connection

IBM still has not improved its 33.6K dial-up lines, and our connection speeds averaged just under 28.8Kbps, the same as in *APC's* May reviews. We also had 14 failed connections, which is already approaching an unacceptably high number of busy signals for most users, and may well be due to the 15:1 user-to-modem ratio. IBM has introduced an x2 56K connection, which we did not test (we only tested ISPs with K56Flex connections), but it is fair to assume the modem connection speeds would be better on these new lines.

Our tests showed a slow but very reliable connection. Ping response to the US was very good, and IBM has by far the most reliable connection to the US, judging from its very impressive 0.4% packet loss. This is backed up by the lowest number of failed FTP transfers at 33.6K — there were only two failures out of 100 transfers from both the US and Australia. Ping results to Australian sites were faster than average, and packet loss was particularly good. FTP times were among the slowest, but this is a function of the lower connect speeds as well as of IBM's network.

IBM's pricing plans seem a lot better suited to people who regularly check their email but use the Web infrequently. Its plans for frequent use — such as $75 for 30 hours' access — are a little on the outrageous side. With POPs in 12 major Aus-

tralian cities as well as access in 52 countries, IBM is a good way for travelling business people to keep in touch.

Josh Mehlman

■ Phone	1300 307 005
■ Online	http://www.ibm.net/
■ Services	Web hosting, site management, network integration, consulting
■ In short	The speed isn't great, but business travellers will find it hard to beat for interstate and overseas access.

Magna Data

Magna Data has always had a strong focus on business access, and while it has not entirely abandoned dial-up access, there is certainly a stronger emphasis on

permanent connections. Magna Data has 33.6K modems and only one dial-up pricing plan — $49 per month for 50 hours' access, which would suit businesses with medium to heavy Internet requirements. This account comes with 5M of Web space, enough for a basic business site. Magna Data is also happy to help out with more complex Web site solutions.

Magna Data claims a user-to-modem ratio of 5:1, and we couldn't connect five times out of 100. In real terms, this means an occasional busy signal during peak times. Magna Data's ping response times were among the best, but ping packet loss was more variable, so it is a fast, but not immensely reliable, connection. This seems to be backed up by the fact that although FTP times were fast — second fastest from the US site and faster than average from the Australian site — a lot of the FTP transfers didn't make it.

While Magna Data has only one dial-up plan, there is a large range of permanent connection options, from 64Kbps ISDN to 2Mbps. Magna Data's technical support, as well as being free, is available from 8am to 8pm, which fits a lot better with the extended working hours of many people.

Josh Mehlman

■ Phone	(02) 9272 9600
■ Online	http://www.magna.com.au/
■ Services	Web hosting, site management, network integration, consulting, broadband connections, co-location of server, domain name registration, secure Internet access
■ In short	A strong choice for business customers, with a wide range of options for permanent connections.

Mira Networking

Mira Networking is a small ISP with only three POPs in Sydney, Melbourne and Brisbane. Mira performed rather well in our tests, mainly due to the fact that it has a

NEW Web Hosting Package

Put your name on the Net for less than $1 a week*

NetRegistry, Australia's leading domain name specialist, can show you how to get your business name on the Internet for just $199 set up fee and from only $50 a year.

By putting just your name on the Net, you'll have an address that belongs to you and reflects your own identity. Which is a very important step to gaining prominence for your business on the Net.

NetRegistry Domain Name Packages

incl. customisation of web site address eg. www.yourname.au.com

yourname.au.com	$199 once only set up fee	+ $50 p.a. Domain Name Authority fee
yourname.com.au		+ $125 two year fee
yourname.net.au		+ $125 two year fee
yourname.com		+ $125 two year fee, then $62.50 p.a.
yourname.net		+ $125 two year fee, then $62.50 p.a.
yourname.org		+ $125 two year fee, then $62.50 p.a.

With the new **au.com** domain name ending, you can have any name you want, on a first-come, first-served basis. In just 30 minutes, you can have a customised business Internet address.

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And to make things even easier, NetRegistry's web site has a **FREE SEARCH TOOL** so you can quickly find out if your name is available.

Call us or check out our web site and we'll show you how to put your name on the Net for $1 a week*.

Ask us about our great value Professional Email and Web Hosting packages, too.

If you are a PISP or Reseller please call us about the NetRegistry Partner Program.

*after initial set up fee

au.com

"We couldn't get 'insurancebroker' with Melbourne IT, then found out we could with au.com. We said to our ISP, "You should let all your customers know about the opportunities with au.com. It would be a great service to offer them."
Wayne Dorgan, Director,
Corporate Insurance Management Group

"I do think that alternative names should be available, so I do encourage the development of the 'au.com' domain."
Jon Postel, Director,
Internet Assigned Numbers Authority (IANA)

NetRegistry

Web Hosting

The **NEW Web Hosting Package** from NetRegistry gives you phenomenal speed, a massive 50Mb of webspace as standard, your own domain name, customisation of employee email addresses, email redirection and free support.

All for just $149 set up and $59 a month fee (plus the Domain Name Authority fee listed opposite).

NetRegistry uses ZEUS professional web server software which has "shattered the world record for web server performance" and "comes out on top, beating Netscape Enterprise v.3.5.1, Microsoft II v.4.0, Apache v1.3 and Sun Web Server v1.0" according to 'Network Computing' magazine (Germany), July '98.

ZEUS also creates a CGI sand-bin for each virtual server allowing customers to install their own CGI's directly onto the server.

And to further ensure your web site is incredibly fast, our servers are located on the Australian Internet backbone.

Added to this, you will be dealing with an Australian operation that provides dedicated and expert advice on web hosting, with systems second-to-none.

Why not give your name and web site prominence on the Net.

Call NetRegistry on 1800 788 082 or check us out at our web site.

Call 1800 788 082 **www.netregistry.au.com**

solid backbone of a 6Mbps connection to Telstra, 2Mbps to Access One and 2Mbps to VIX/Ausbone and Paradox. Mira also has a global roaming feature that enables customers to dial into the service from within 52 countries for the cost of a local call.

The test results for Mira Networking were consistent with an ISP that has reliable connections and speed. The ping response time was average to good, while the percentage of lost packets was low. FTP transfer times were above average for all sites and transfers rarely failed to complete.

The pricing plans are also attractive, ranging from $35 per year for seven free hours to the popular business plan: $20

set-up fee, $65 per month for 50 free hours and a $2.50 charge per extra hour. All of the dial-up price plans include 6M of Web space. ISDN lines can also be set up for $500 for a permanent connection, $150 for a monthly connection, or $5.50 an hour for a dial-up connection.

The customer service side of Mira Networking has been expanded since our last look, and now includes more services such as Web programming, domain registration and database hosting.

Darren Ellis

Phone	1300 360 080
Online	http://www.mira.net/
Services	Web hosting, site management, network integration, consulting, domain registration and hosting, firewalls, SMTP and UUCP gateways, database hosting and Web programming.
In short	A well-priced and reliable service, but a bit short on POPs.

Netspace

Competitive pricing plans for hobbyists and some reasonable business access schemes have brought plenty of users to Netspace over the past few years.

How we tested

The ISP tests were carried out in *APC* Labs using a Digital PC3000, a PII 266MHz based system with 64M, running OS/2 Warp Version 4. We used a NetComm Roadster K56Flex modem connecting at 56K or 33.6K, depending on the tests.

To qualify for the review, ISPs needed to have multiple POPs, with a minimum of three in major Australian cities, one of which had to be Sydney. Since *APC* Labs are located in Sydney, we dialled into the Sydney POP for each ISP.

In order to reliably and constantly test the ISPs, the machine was left running for three weeks between August 19 and September 9, 1998, using *APC*'s ISP testing scripts written in REXX. The scripts cycle through a series of ping, trace and FTP tests in order to determine the quality of an ISP's service.

Exactly 100 test runs were carried out over the three-week period (each ISP was dialled and tested 100 times), producing a total of 3,000 result files. These files were then processed by a second REXX script to produce the averages you see on page 130.

The results

In order to measure performance, both within Australia and overseas, we tested four Australian sites and one site in the US.

AU1 (OzEmail)	203.108.7.7
AU2 (Connect)	203.63.84.156
AU3 (Access One)	203.12.176.149
AU4 (Telstra)	192.148.160.100
US (Walnut Creek FTP)	209.155.82.18

For the FTP tests we transferred a 501K file (FREROTAT.ZIP) from both the Walnut Creek FTP server (ftp://ftp.cdrom.com/) and a popular Australian mirror (ftp://ftp.tas.gov.au/).

Walnut Creek is renowned for its large archives and fast transfer speeds. ISPs with better links to the US will show up clearly in the results for the ping and FTP tests to Walnut Creek.

In order to separate the best from the good for Australian local testing, we chose a popular and slow Australian mirror. Just like the US testing, those ISPs with superior links will show up with faster results.

Testing covered the following categories:

Successful connects shows the number of times the modem successfully connected to the ISP. All averages are based on this value.

Failed connects shows the number of times the modem failed to connect. This may mean the ISP was engaged, although problems such as poor line quality can also cause modem handshaking to fail.

Connect speed shows an average of the connect speeds reported by the modem for all successful connects.

Ping packet loss is an overall reflection, as a percentage, of how congested the ISP's link is to the respective US and Australian sites. The ping test sends out 25 packets, and measures the number of dropped packets and the average round-trip time it takes for packets to return.

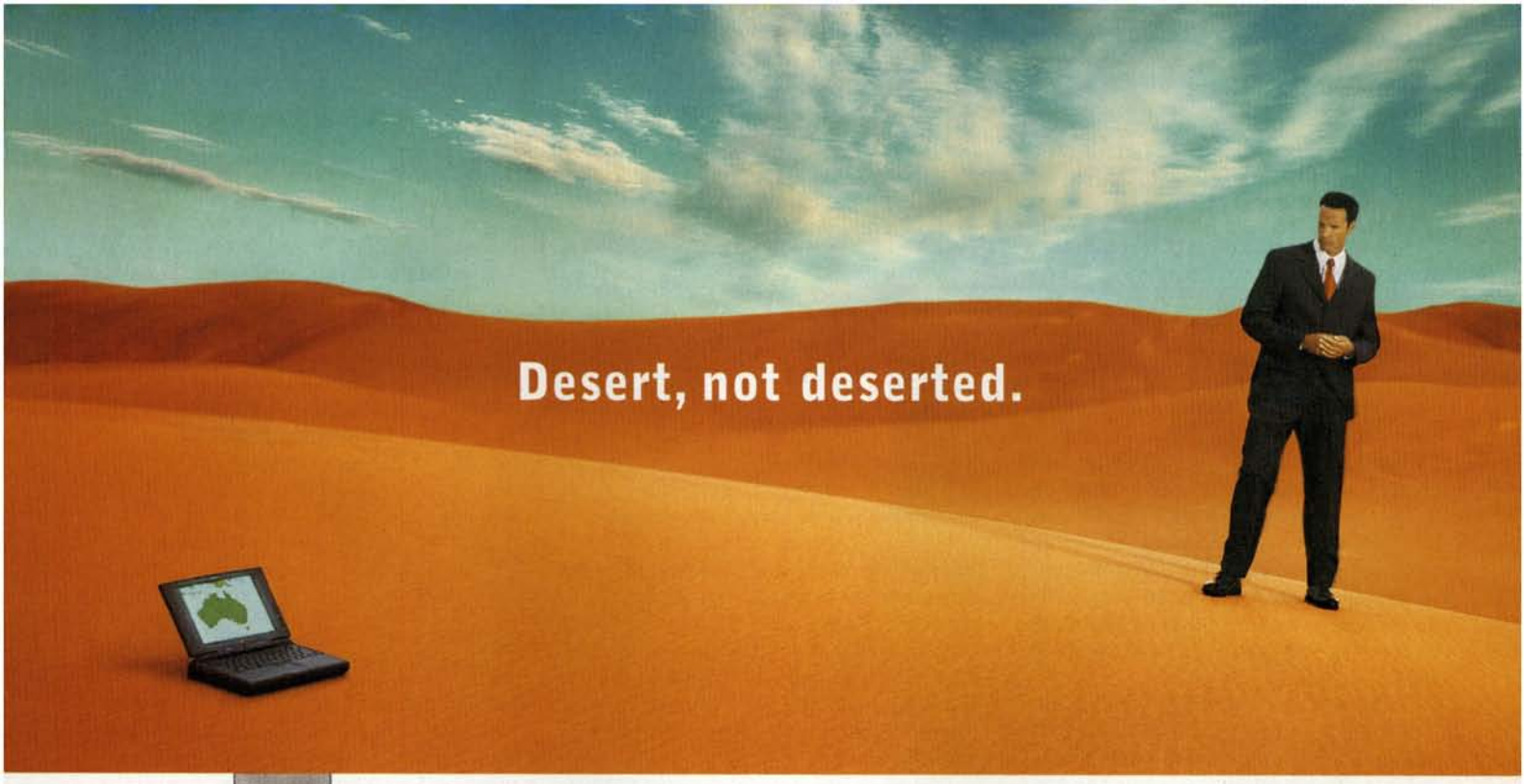
Packet loss is more likely to occur when contacting sites overseas, as congested networks and other conditions beyond the ISP's control can lead to packets going missing. A low value here means an ISP consistently provided a reliable link, whereas a high value reflects problems such as pauses and timeouts experienced while accessing the Internet.

Ping response is a measure in milliseconds of how fast the ISP's service is to the respective US and Australian sites. A fast response time means the ISP was able to deliver data quickly; a slow response time is often indicative of a poor or busy link, sometimes also reflected in high packet loss.

FTP time is a reflection of both the ping response and ping packet loss values. We measured how many seconds it took to retrieve our test file from the US FTP site and the Australian FTP site. FTP time is the average transfer time of the number of successful transfers, and therefore accurately reflects the ISP's ability to provide a reliable service.

Failed FTP retrievals is a reflection of the stability of the ISP's service, measuring the number of FTP transfers that failed to complete due to timeouts and lost packets.

Ashton Mills



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TDK 0199 The HALE Agency

Some customers love it; others pick a few faults, such as the past censorship of controversial Web sites built using the 5M server space allocated to each Netspace user (higher volume Web hosting is also offered).

A user-to-modem ratio of 13:1 isn't great, but only seven times did we experience problems getting a line during our 33.6K tests, during which the modem always connected at full speed. Once connected, ping response times from Australian sites were reasonably good (averaging around 170ms), but Netspace was fairly distant from our US ping target at 532.9ms, with an unacceptable 12.9% packet loss over Netspace's 4Mbps link to the US.

This was reflected in FTP testing, where a slow average of 213.1 seconds was returned for transfers from the US (with six failed attempts), while the Australian FTP result sat firmly in the top five at 143.7 seconds with only four failures. It should be noted that of 100 attempts to transfer the Australian file 22 failed, but this was also the case with several competing ISPs.

Online documentation at Netspace's

Web site is quite good, although parts appear to be seriously out of date (one part of an FAQ claims the Web has only become graphical in the past year). The Web site also points to several online game servers run locally, which offer low-ping gameplay between Netspace users.

Netspace offers a wider range of business services than many ISPs, and plenty of high-bandwidth options, but its permanent modem connection could end up being quite pricey due to volume charging. On the other hand, the diversity of Netspace's connectivity and peering arrangements is good — this ISP is directly linked to Connect, Telstra Internet, UUNet, Access One, Melb-Nap and WAIX, offering overseas access through iPass.

Simon Vandore

■ Phone	1300 360 025
■ Online	http://www.netspace.com.au/
■ Services	Web hosting, site management, network integration, consulting, UUCP/POP3 gateways
■ In short	Thorough service and cheap pricing plans, let down by poor overseas connectivity.

OzEmail

For quite some time, OzEmail has been Australia's largest ISP, and its recent acquisition of Access One has only reaffirmed that position. It has the most subscribers, a huge number of POPs in all states and territories (38 in total), and massive bandwidth both locally and internationally.

It also provides a vast array of services, from consulting and management services to connection services via just about any means you can think of. For global

Sorry.

We'd normally be using this space to promote our Internet services. But with our customers doing such a great job spreading the word for us, we thought we'd give it a miss this month.

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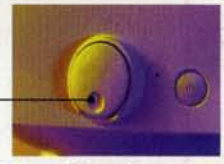

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AOL Australia arrives

As one of the world's best-known ISPs, AOL (America Online) makes a lot of noise, and it's getting louder now that the AOL Australia operation has launched. We used a beta AOL Australia account for a week or so, but couldn't test it like the other ISPs reviewed here because of AOL's proprietary Windows dial-up software.

AOL Australia calls itself an 'Internet online service'; members have access to email, real-time chat, news, entertainment, financial information, computing support, interactive magazines and newspapers and more, in addition to Internet access. Much of the content is generated locally and accessed via a friendly interface. Aimed squarely at the mass market, there are two monthly pricing options. AOL Now costs $9.95 for the first three hours, and $4 per hour after that. AOL Extra costs $29.95 for 15 hours, then $4 per hour after that.

AOL has POPs in 120 countries and all the world's major cities, making it a good bet for travellers and the frequently connected. As befits a consumer-oriented operation, free telephone support is available 24 hours a day, seven days a week.

Although no corporate services such as ISDN dial-up or frame relay access are offered, each account scores 10M of Web space and Web design software for designing your own Web page (when we looked at it the 'Create your own Web page' facility was still under construction).

AOL Australia has POPs in Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart and Canberra — all have 56K access speeds. When *APC* browsed AOL Australia's content it seemed OK. Most of the general news seemed up-to-date, but some material — for example, in the Sport channel — was static over several days. An example of the 'user community' feel engendered by AOL were polls asking you to vote on questions like 'What's the best football code?', and 'Should Australia have a GST?'.

For more information about AOL Australia, call 1300 654 633, or go to http://www.aol.com.au/.

Steven Fear

travellers, OzEmail is also an ideal option, due to partnerships with international ISPs as part of its iPass program.

The relatively recent introduction of an all-you-can-eat service gives OzEmail additional appeal. The availability of the service — in Sydney at least (the POP we dialled into) — was excellent. Only once did our testing system fail to connect.

OzEmail performed well, with good response times and quick FTP downloads, although the packet loss statistics show that there are some problems with congestion on the network (if not for the packet-loss problem, OzEmail would probably have had the fastest FTP times). People interested in applications particularly sensitive to packet loss (such as online gaming) be warned.

All up, a top ISP — you can't go far wrong with this one.

Nathan Taylor

Phone	132 884
Online	http://www.ozemail.com.au/
Services	Web hosting, site management, network integration, domain name registration, SMTP and UUCP gateways, VPNs, and more
In short	Great value and good performance, although packet loss is a problem.

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Planet Internet

Planet Internet has expanded its reach a great deal in the last six months, adding 10 POPs. The new access points are divided between the outer suburbs of Melbourne, Sydney and Brisbane. Planet Internet has also recently merged with Melbourne-based ISP StarNet. Unfortunately, the increased demand for bandwidth that this expansion and merger have caused does not appear to have been backed up with increased bandwidth in Planet Internet's backbone connection. Planet Internet is rather vague about its network links to the rest of the world, so it's hard to draw any conclusions.

In our May review this ISP showed a slow but very reliable connection. However, this current set of tests gives a very different picture. Although Planet Internet

had the fastest ping response to the US at both 33.6K and 56K, its ping response times to Australian sites were among the slowest. Ping packet loss to the US was average, but ping packet loss to Australian sites was unacceptably high, reaching up to 10%. FTP times were average to slow, with large numbers of failed FTP transfers, except for transfers from the US at 56K, which were quite good. These results indicate a connection that is neither fast nor reliable. On the good side, Planet Internet was one of the most available ISPs, with only one failed connect at both 33.6K and 56K.

Planet Internet's pricing also needs to come more in line with other ISPs. At the moment, all its pricing plans are among the most expensive, and unless customer service is exceptionally good, better value packages are available.

Josh Mehlman

■ Phone	(03) 9205 0300
■ Online	http://www.planet.net.au/
■ Services	Web hosting, site management, network integration, consulting, Web development, VPN, extranets, security consulting
■ In short	Too expensive, considering its relatively poor performance.

Switch Telecommunications

Switch operates five POPs in Adelaide, Brisbane, Melbourne, Perth and Sydney. Its local link is a combined 4.5Mbps connection through Access One/OzEmail, Connect, Global One and Zircon, but it still doesn't appear too stable. The line quality hasn't been improved since May when we last reviewed this ISP. Back then we noted that there seemed to be bad connections to the US, and that problem still exists.

On the 56K connection, Switch lost 13.7% of packets pinged to the US but fared better with the four local sites, although it came in below average on all except one. Switch rated even worse on the 33.6K line, losing a huge 19.9% of US packets and also coming near the bottom of the heap in terms of lost Australian packets. FTP transfers, when they worked, came though extremely slowly from the US on both connection speeds, but once again the Australian links were more reliable.

Switch offers different services, ranging

from switch.mail ($4 per hour with only email access), switched.on ($29.95 per month for 50 hours' access) and switched.on.100 ($39.95 per month with 100 hours' access), which is a more palatable price than those asked by the other ISPs. For business it offers ISDN services at quite a reasonable price: $115 per month gives you 40 hours' use, $225 gets 80 hours and $315 gets 120 hours. If you do encounter problems with your mail or surfing, then you can always call the 24-hour, seven-day support line — something that not many ISPs offer.

Darren Ellis

■ Phone	1800 641 934
■ Online	http://www.switch.net.au/
■ Services	Web hosting, site management
■ In short	Bad US connections, but not too bad for Australia.

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Better service, bigger bucks

Today's Internet service providers all look pretty much the same: dial-up PPP access for applications like the Web and email, disk space for a home page, bandwidth shared between thousands of users, and a credit card bill every month. Jazzy ISPs may offer basic content such as stock quotes, news headlines and astrology, but there's generally little to separate ISPs, because they all essentially provide access and little else.

That uniformity could soon change as the arrival of AOL intensifies competition in the ISP market. Net providers will increasingly look to differentiate themselves with premium services that keep customers loyal while still generating new revenue once the squeeze begins.

Premium services are based on the same IP network infrastructure, but they go beyond simple access to the Net. The most obvious examples of new services include voice over IP (VoIP), videoconferencing, short messaging, fax, online games and virtual private networks (VPNs).

Already ISPs such as OzEmail are diversifying into VoIP services to deliver more valuable services. The commercial attraction lies in charging more for carrying high-priority IP packets over existing infrastructure. An average OzEmail dial-up connection requires 12Kbps throughput while generating roughly $3 in hourly revenue, according to company figures. In contrast, voice lines demand only 8Kbps and return $4 per domestic hour or a whopping $20 per hour for international calls.

Moreover, the ISP believes phone services are actually easier to sell than the Internet, since customers already understand phones. And because it developed the Interline technology itself, OzEmail is generating new revenue licensing the platform to Internet hardware manufacturers and ISPs around the world.

OzEmail won't have the market to itself for long, though. In June Telstra began a six-month trial of VoIP services to London

for Big Pond Internet customers. Even smaller ISPs like Melbourne-based Planet Internet are getting into the game. It also offers email alerts to subscribers' mobile phones, VPN services and an inbound fax-to-email service that delivers encapsulated fax messages to customer inboxes.

"It's all about value-add because it's such a competitive industry," said Planet Internet director Joe Barber. He warned that smaller ISPs will not be able to compete with the marketing resources of telcos on services like VoIP and GSM short messaging, where off-the-shelf software is now available. Service providers will need to focus on developing unique technology advantages, such as the fax gateway that Planet developed inhouse.

"Small ISPs will struggle to maintain quality and add value," he says. Barber sees a real opportunity for ISPs that provide VPN tunnels to business customers, allowing them to hook up branch offices over the Net. Customer concern over security and inconsistent vendor implementation of the Point-to-Point Tunnelling Protocol (PPTP) standard is constraining VPN take-up, but Barber says it's now starting to grow faster.

Videoconferencing over the Net is another golden opportunity for ISPs. Bandwidth requirements will tax smaller providers, but larger ISPs like Big Pond could open significant new markets if the price is right. The Telstra subsidiary launched an IP-based videoconferencing service last month.

Online games are another likely growth area. Traditional ISPs like Microplex and OzEmail already have significant investment in game technology, while gorillas like Telstra and Sega are just beginning to flex their muscles. In September Telstra extended its Wireplay service to the broadband hybrid fibre-coax cable network, providing serious new temptation for hard-core gamers.

Premium services represent a new stage in the Internet industry's evolution, and the fight will be tough. "It's difficult to compete because everyone immediately copies good ideas," said Barber. "You can only lead the market for about three days."

Dan Tebbutt

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The value equation

One thing you've probably noticed about these reviews is that while we've given you lots of technical information about each ISP, we haven't made many judgements on which ISP represents the best value. This is because value is a highly subjective proposition; it depends on each person's needs.

For some, price is the most important factor; and whichever ISP provides the highest number of hours for the lowest cost represents the best value. Even if performance isn't that great, and you get busy signals for five minutes before getting online, you will tolerate these inconveniences, as it meets your budget.

Others view performance as the most important, and are willing to pay extra for an ISP that offers fast, reliable connections. There are Net users who don't care so much about performance, but shudder at the thought of a busy signal when trying to connect. And of course an ISP may offer everything you want in terms of price, performance and line availability, but that doesn't help if you live in Towoomba and it doesn't have a POP in your area. While it's easy for us in Sydney, people looking for Internet access in smaller cities or remote areas find their choices are a bit more limited. In all these cases, an ISP may be good value even if it costs more, because it provides what you want at a price you find acceptable.

However you construct your value equation, the aim of this feature is to give you enough information to decide on an ISP which represents the best value for you.

Josh Mehlman

Telstra Big Pond Home

As some of the smaller ISPs started moving away from unlimited-use monthly accounts (such as Zip), the bigger players such as Telstra Big Pond Home finally began offering plans of the all-you-can-eat variety — but then brought in time restrictions themselves.

Big Pond now offers a plan for frequent Net users known as BIG150 which costs $44 a month for 150 hours of use and 5M of Web server space. Although the plan

sounds generous, the fine print reveals that a user will be disconnected after more than five hours of use or 20 minutes of inactivity, that in peak periods modems may not be available, and that unused hours may not be accumulated. At the time of writing, the plan was available only in Sydney, Melbourne and Brisbane.

For users not requiring such heavy Net use, Big Pond offers a number of other plans starting from $9.90 per month, which includes three hours' access. There are no set-up fees on any accounts.

We tested Big Pond's 33.6K and 56K lines. In both cases, we experienced a low number of failed connects and very good network performance. Big Pond ranked in the top five in ping times to both the US and Australian sites. FTP times to the Australian and US sites also ranked very highly, and the maximum number of failed FTP retrievals in any test was five out of 100.

Big Pond offers excellent technical support hours (8am to midnight, seven days a week) and a reliable service to users across Australia using any one of its 55 POPs. International POPs are expected to be available by the fourth quarter of 1998.

Roulla Yiacoumi

■ Phone	1800 804 282
■ Online	http://www.bigpond.com/
■ Services	Web hosting, personal home pages
■ In short	Great overall network performance and coverage, excellent technical support hours, and an array of pricing plans.

TIG

The Internet Group (TIG) offers some pretty low prices, but we experienced 27 failed connects during our 100 tests of 33.6K connections, and 30 failures at 56K — the poorest result in this review. This suggests a high proportion of engaged

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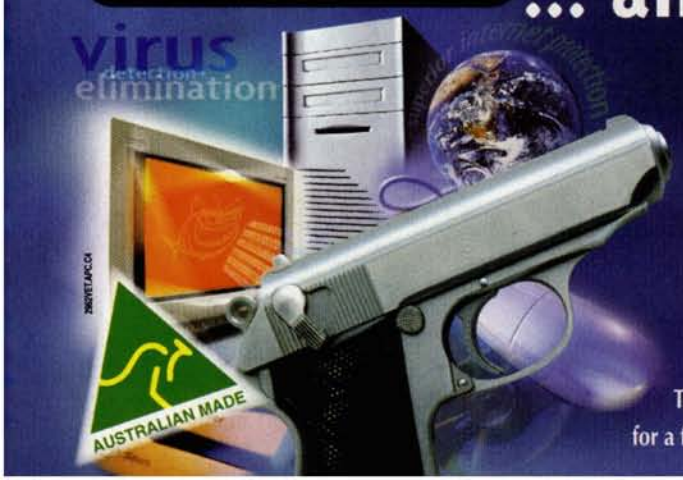

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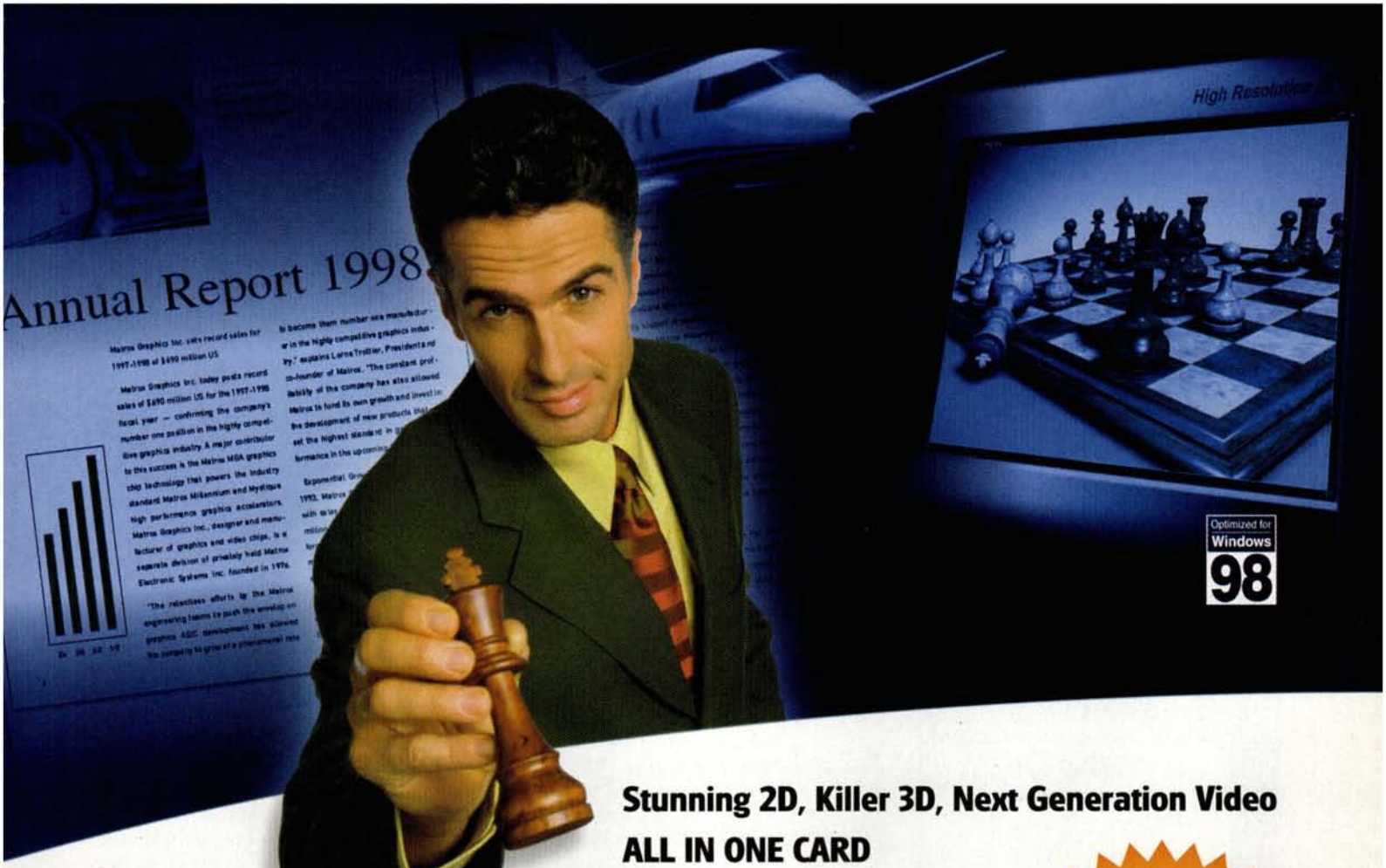

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The ISPs we didn't review

All of the ISPs in this feature have multiple Australian POPs and a presence in more than one city, including Sydney. All tests were conducted from a dedicated machine in *APC* Labs in Sydney which dialled into each ISP on a rotational basis and performed a series of tests.

While a number of ISPs qualified for inclusion in this feature, not everyone was keen to participate. The two notable omissions from this feature are One.Net and Microplex.

All of our phone calls to One.Net went unanswered. We left numerous messages with the powers that be, but not one was

returned and so we eventually gave up. After all, if *APC* was not able to penetrate One.Net, what chance did the consumer stand?

Our experience with Microplex was similar. After being unable to contact anyone who cared to return our calls, we called its new owner, Optus. The folks at Optus were apologetic and seemed interested in having Microplex included in our feature but it wasn't to be — that was the last we heard

from them. We are, however, almost willing to excuse Microplex. Being bought out and undergoing internal changes can be unsettling for any organisation.

Interestingly, the above two ISPs also drew the greatest criticisms from our readers in our recent ISP Service & Reliability survey 1998 (see page 140).

LibertyOne (formerly MagNet) withdrew at the last minute, citing upcoming changes to its business structure.

Roulla Yiacoumi

lines, confirmed by several users with whom we spoke. Although TIG claims it has a generous 6:1 user-to-modem ratio, things do appear to get very crowded at peak times.

On the performance side of things, TIG's results were mixed. Despite terrible ping response times (often lowest or second-lowest) to both US and Australian sites, the FTP times were respectable. In fact, our fastest 33.6K FTP time from the Australian site (128.5 seconds) was recorded via TIG, although other results at both connection speeds weakened the averages. These poor pings and slightly higher-than-average packet losses led to a number of failed file transfers. Eleven Australian transfers failed at 33.6K, and seven at 56K. US transfers fared best, suggesting this provider has much better international than Australian connectivity.

High pings mean that playing online games or trying other such 'live' activities via TIG would be next to impossible. Those more interested in Web access and file transfer should find performance acceptable, but transfer requests may be slow to initiate.

TIG is part of IHUG (originally Internet Home User Group), one of the largest ISPs in New Zealand, so if you transmit a lot of data to or from Aotearoa, TIG's fast (45Mbps) link to Auckland might suit you well.

While most TIG pricing plans are structured to suit low-volume users, a $25.95 monthly fee gets you unlimited time online — a rare thing in these days of 150-hour 'almost unlimited' accounts. A basic guidebook is provided with new accounts, but there's also a quick-start sheet for experienced Internet users.

Simon Vandore

Phone	1800 353 700
Online	http://www.tig.com.au/
Services	Web hosting, site management
In short	Engaged lines, dire ping times and poor Australian connectivity — but fairly good international speeds at a reasonable price.

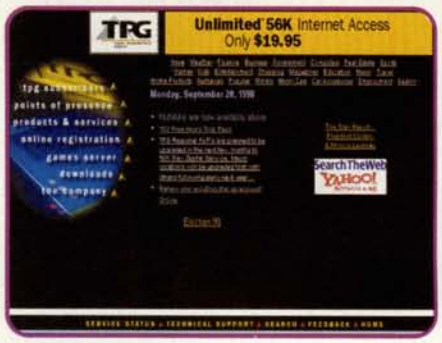
TPG Internet

In our last round of reviews, TPG Internet was a solid but unspectacular player. Not much has changed on that front at least – TPG Internet came in the middle of nearly all our score results. The only poor figure was the FTP failure rate for the US site, where it ranked second last for 33.6K connections and last for 56K. This appears to be borne out by the Australian FTP results, where once again TPG Internet was plumb in the middle of the field.

TPG Internet is one of the larger players in the Internet market, and rated in a fairly similar style to the other large players, such as OzEmail and Telstra Big Pond. While these larger operators may not be testing at the absolutely highest rates, the middle ground performance indicates at least consistent performance, which should be better than, say, a fast but unreliable service.

TPG Internet has 50 POPS throughout Australia, meaning that there is a strong likelihood of a POP being near most readers.

There are a variety of payment plans, all formed around a one-off payment for a certain number of hours per month over a year, starting at $120 for 120 hours (10 hours per month minimum) with 10M Web space. This is reasonable value, but you must supply the cash up front, which may be a problem for those used to paying a monthly rate.



Technical support is an additional expense, and cost $2 per minute at the time of writing. This was very expensive — most ISPs in this review offered this sort of service for free.

Alex Kidman

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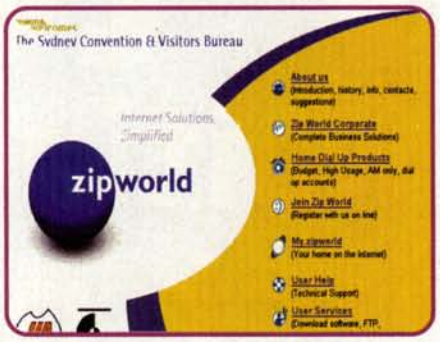

Zip World

After our last review of Zip appeared in these pages in May 1998, the folks at Zip got particularly animated by our review and whacked a nasty commentary on their Web site complaining about *APC*'s underwhelming support for a battling Aussie ISP. Furthermore, they demanded an apology.

Well, they didn't get one, and the offending file has now been removed from the new Zip World Web site. Zip and World Reach, both established in 1995, merged in April of this year, and a new Web site went live shortly afterwards. Zip World claims to have 10,000 users on its books.

Signing up with Zip costs $50 — the highest set-up fee of any ISP we tested (although TIG's $49 isn't far behind). After that, there are two main plans to consider: $39 per month (150 hours and 5M of Web space) or $29 per month (40 hours' access and 5M of Web space).

We tested Zip World's 33.6K and 56.K modem lines. Its US Ping times were fairly dire in both cases, ranking among the worst results. Ping response times to the Australian sites were an improvement, scoring highly in the 56K tests, but ping response times were not as great using the 33.6K lines.

FTP times to both the US and Australian sites ranked in the top half. Zip recorded the lowest US FTP failed retrievals (on its 33.6K lines) and the fastest average Australian FTP time (56K lines), in the latter case beating Telstra Big Pond by just under half a second.

Zip is one of the handful of ISPs that offers telephone technical support only on weekdays, between 10am and 8pm.

Roulla Yiacoumi

■ Phone	(02) 9253 5777
■ Online	http://www.zipworld.com.au/
■ Services	Web hosting, site management, network integration, consulting
■ In short	Some good results, but poor US ping response times.

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33.6K results

ISP	Connect speed	Connects		Ping packet loss (%)					Ping response (ms)					FTP time (s)		Failed FTP retrievals	
	K	Success-ful	Failed	US	AU1	AU2	AU3	AU4	US	AU1	AU2	AU3	AU4	US	AU	US	AU
Access One	33.2	98	2	14.4	3.3	0.9	0	3.4	495	153	184	141	185	159	147	6	12
CompuServe Pacific	33.6	81	19	1.4	7.3	2.3	4.7	1.9	655	514	603	532	563	165	161	3	22
Connect	33.6	91	9	7.4	2.6	1.1	1.1	1.3	405	164	158	166	171	141	138	2	5
DIALix	32	100	0	9.6	2.6	0.8	0.4	1.1	499	248	251	256	262	181	151	3	8
Dynamic Bell's NetWorld	33.6	86	14	9	4	1.8	2.4	3.4	452	227	220	219	243	187	163	3	2
EISA	33.4	84	16	7.8	18	8.3	2	7.3	591	237	471	251	465	150	147	5	6
Geko Internet	33.6	95	5	17.6	1	1.4	1.8	2.4	489	186	206	214	217	240	151	7	4
GigaNet	33.6	94	6	20.3	11	1	11.3	11.9	480	439	237	471	464	438	296	6	17
IBM Internet Connection	28.7	86	14	0.4	1.5	1	1	1.1	391	175	186	181	197	184	163	2	2
Magna Data	33.6	95	5	2.6	1.3	2.6	1.4	1.2	395	141	156	153	178	145	144	7	7
Mira Networking	33.6	98	2	5	1.7	1.2	0.9	1.3	438	209	188	187	210	162	139	3	3
Netspace	33.6	93	7	12.9	2.2	0.7	0.8	1.3	533	171	157	169	183	213	144	6	4
OzEmail	33.6	93	7	12.5	4.9	7.3	5.3	5.6	501	144	211	178	179	171	148	2	3
Planet Internet	33.6	99	1	7.7	4	7.4	8.7	5.9	374	431	439	431	453	195	162	10	7
Switch Telecommunications	33.6	99	1	19.9	4.9	6.3	5.1	6.7	540	207	185	206	207	300	148	8	5
Telstra Big Pond Home	33.6	94	6	7	1.3	1.1	1.1	1.6	406	141	154	149	172	148	141	4	5
TIG	33.4	73	27	6.2	2.8	3.3	3.5	2.5	543	549	542	542	564	158	148	3	11
TPG Internet	33.6	93	7	12	1.6	2	4.3	2.2	491	284	283	275	285	174	146	9	5
Zip World	33.6	97	3	9.6	4	1.6	3.3	2.3	552	192	185	187	196	155	140	2	4

56K results

ISP	Connect speed	Connects		Ping packet loss (%)					Ping response (ms)					FTP time (s)		Failed FTP retrievals	
	K	Success-ful	Failed	US	AU1	AU2	AU3	AU4	US	AU1	AU2	AU3	AU4	US	AU	US	AU
Connect	49.8	85	15	5.1	2.6	2	0.8	1.4	386	146	141	141	152	104	113	2	3
Dynamic Bell's NetWorld	50	88	12	7.1	3.5	1.8	0.6	2.5	439	217	203	211	242	167	158	1	3
Geko Internet	50	96	4	13.9	1.7	3.8	1.5	2.2	482	180	196	195	203	184	126	4	6
Mira Networking	45.7	98	2	4.9	1.8	1.1	0.9	0.9	439	196	187	165	194	126	117	3	2
OzEmail	48.5	99	1	14.3	4.5	6	5.5	6.3	453	115	190	154	153	117	121	1	3
Planet Internet	49.7	99	1	7.9	5.7	7.5	8.3	10.2	357	412	422	414	433	153	140	3	10
Switch Telecommunications	49.9	90	10	13.7	3.4	3.9	2.2	2.8	514	203	177	208	197	252	122	6	5
Telstra Big Pond Home	50	96	4	8.5	3.8	2.6	1.5	2.4	393	122	135	131	155	108	113	4	5
TIG	50	70	30	4.3	5.1	1.8	2.7	4.9	516	521	517	518	543	109	119	2	7
TPG Internet	50	93	7	12.2	4	1.4	0.9	2.2	477	256	240	233	242	128	119	7	5
Zip World	49.1	96	4	7.9	3.9	1.3	1.1	1.2	554	158	152	151	155	118	113	1	4

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Specifications: ISPs

ISP	Access One	CompuServe Pacific	Connect	DIALix	Dynamic Bell's NetWorld
Phone	1800 818 391	1300 55 55 20	1800 818 262	(02) 9972 9357	(02) 9281 6652
Online	http://www.aone.net.au/	http://www.compuserve.com.au/	http://www.connect.com.au/	http://www.dialix.com.au/	http://www.dbnw.net.au/
Maximum connect speed	33.6K (56K V.90 to be installed soon)	56K (x2)	56K (Flex)	33.6K	56K
Tech support times and fees	24 hours, 7 days, no fees	Monday to Friday 7am to 7pm, Saturday 8am to 1pm, no fees	Monday to Friday 8am to midnight, Saturday, Sunday and public holidays noon to 8pm, no fees	8am to 9pm (AEST), 7 days, $2 per minute	Monday to Friday 8.30am to 9pm, Saturday 10am to 9pm, Sunday 10am to 6pm, no fees
Number of POPs	41	10	6	10	31
Network links	45Mbps satellite, 100Mbps Telstra and Optus	2 x 1.5Mbps to CompuServe US	200Mbps to Telstra Internet	1Mbps to Telstra Internet	512Kbps to Connect
International POPs	UUNet	CompuServe network in over 185 countries	GRIC (Global Roaming Internet Connection) in over 60 countries	None	None
Pricing plans					
Plan 1: Set-up fee	$25	None	None	None	$25
Monthly fee	none	$14.50	$10	$40	$18.95
Hours per month	none	2	3	50	50
Additional hours	$5*	$5	$3.50*	N/A	$1.95
Web space	6M	5M	None	None	5M
Plan 2: Set-up fee	$25	None	None	None	$25
Monthly fee	$19.95	$35	$20	None	$50 for 50 hours
Hours per month	7	10	8	None	N/A
Additional hours	$5*	$3.50	$3.50*	$1.80 ($5 minimum payment)	N/A
Web space	6M	5M	None	None	5M
Plan 3: Set-up fee	$25	None	None	None	$25
Monthly fee	$39	$60	$30	$40	$39.95
Hours per month	20	25	14	Unlimited*	100
Additional hours	$5*	$3.50	$3.50*	N/A	$1.95
Web space	6M	5M	None	None	5M
Plan 4: Set-up fee	$25	None	None		$25
Monthly fee	$55	$99	$40		$49.95
Hours per month	30	40	21		Unlimited
Additional hours	$3.50*	$3.50	$3.50*		N/A
Web space	6M	5M	None		5M
Plan 5: Set-up fee	$25		None		$25
Monthly fee	$85		$50		$550 for 10,000hrs or 3 years
Hours per month	50		30		See above
Additional hours	$3.50		$3.50*		NA
Web space	6M		None		5M
Notes	*$2.50 per hour 12am to 8am		*$1.75 off-peak Additional plans available	*Two-hour limit during peak periods, selected POPs only	Additional plans available

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	AKA	(07)38521899
WA	AKA	(08)94433388
NT	Hallmark	(08)89484451

Specifications: ISPs

ISP	EISA	Geko Internet	GigaNet	IBM Internet Connection
Phone	1300 300 928, (03) 9677 9677	(02) 9439 1999	1800 686 889	1300 307 005
Online	http://www.eisa.net.au/	http://www.geko.net.au/	http://www.giga.net.au/	http://www.ibm.net/
Maximum connect speed	33.6K	56K	33.6K	56K (x2)
Tech support times and fees	Monday to Friday 9am to 10pm, Saturday and Sunday 10am to 4pm, no fees, priority help desk $1.50 per minute	Monday to Friday 9am to 6pm, $5 per problem on some accounts	Monday to Friday 9am to 5pm, no fees	Monday to Friday 8am to 11pm, Saturday and Sunday 9am to 5pm, no fees
Number of POPs	6	4	19	12
Network links	155Mbps to Optus, 10Mbps UUNet via PANAMSAT, 2Mbps IBM Global Network	Did not disclose	Did not disclose	2Mbps to Telstra Internet, 5Mbps to US, 512Kbps to Japan
International POPs	None	None	None	IBM Global Network in 52 countries
Pricing plans				
Plan 1: Set-up fee	$25	$30	$30	$25*
Monthly fee	$19.95	$45	$5	$10
Hours per month	20	30	1	3
Additional hours	$2.50	$1.50*	$5	$5
Web space	5M	5M	5M	None
Plan 2: Set-up fee	$25	$30	$30	$25*
Monthly fee	$29.95	None	$19.95	$30
Hours per month	35	None	6	10
Additional hours	$2.50	$5	$3.90	$4
Web space	5M	None	5M	None
Plan 3: Set-up fee	$25	$30	$30	$25*
Monthly fee	$34.95	$40	$30	$75
Hours per month	100M	150 and100M**	20	30
Additional hours	$2.50 per M	25 cents per M	$3.80	$4
Web space	5M	1M	5M	None
Plan 4: Set-up fee	$25		$30	
Monthly fee	$39.95		$49	
Hours per month	Unlimited		35	
Additional hours	N/A		$3.50	
Web space	5M		5M	
Plan 5: Set-up fee				
Monthly fee				
Hours per month				
Additional hours				
Web space				
Notes		*$5 if not billed to a credit card **Three-hour session limit, 15 minutes idle time		*Includes 5 hours

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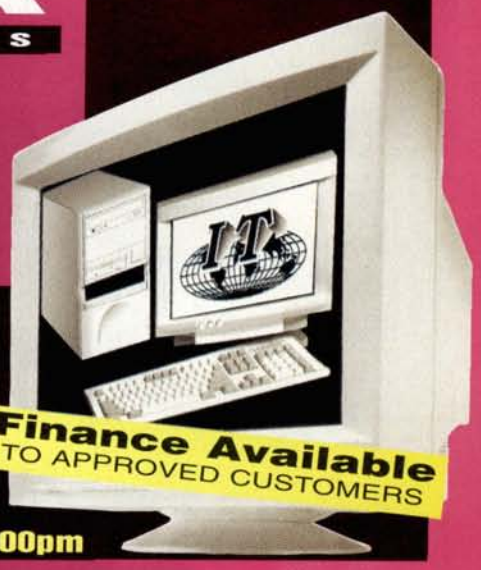

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Online	http://www.magna.com.au/	http://www.mira.net/	http://www.netspace.net.au/	http://www.ozemail.com.au/	http://www.planet.net.au/
Maximum connect speed	33.6K	56K (Flex, Melbourne and Sydney only)	33.6K	56K (Flex, x2 also in some POPs)	56K
Tech support times and fees	Monday to Friday 8am to 8pm, no fees	Monday to Friday 9am to 8pm, Saturday and Sunday 2pm to 5pm, no fees	Monday to Friday 9am to 9pm, Saturday and Sunday 10am to 6pm, no fees	24 hours, 7 days no fees	Monday to Friday 9am to 9pm, no fees
Number of POPs	5	3	13	38	14
Network links	6Mbps to Telstra Internet, 10Mbps to Optus, 6Mbps to Global One	6Mpbs to Telstra Internet, 2Mbps to Access One, 2Mbps to VIX/AusBone/Paradox	4Mbps to Connect, 2Mpbs to Telstra Internet, 4Mbps to UUNet	100Mbps to Telstra Internet, 155Mbps to Optus, 45Mbps satellite	Telstra Internet, Global One
International POPs	IPass	GRIC (Global Roaming Internet Connection) in over 60 countries	IPass	IPass	None
Pricing plans					
Plan 1: Set-up fee	None	None	$25	None	$25
Monthly fee	$49	$2.90*	$20*	$44.95	$25
Hours per month	50	7	20	Unlimited	10
Additional hours	$2	$2.50	$2	N/A	$3.95
Web space	5M	6M	5M	5M	5M
Plan 2: Set-up fee		$20	$25	$25	$25
Monthly fee		$38	$40*	$19.95	$38
Hours per month		21	40	7	22
Additional hours		$2.20	$2	$5*	$3.95
Web space		6M	5M	5M	5M
Plan 3: Setup fee		$20	$25	$25	$25
Monthly fee		$65	$14.17**	$39	$50
Hours per month		50	20	20	30
Additional hours		$2.20	$2	$5*	$3.50
Web space		6M	5M	5M	5M
Plan 4: Set-up fee			$25	$25	$25
Monthly fee			$20**	$55	$80
Hours per month			40	30	50
Additional hours			$2	$3.50*	$2.95
Web space			5M	5M	5M
Plan 5: Set-up fee				$25	$25
Monthly fee				$85	$9.90
Hours per month				50	2
Additional hours				$3.50*	$2.95 to $4.15
Web space				5M	5M
Notes		*Billed yearly	*Billed quarterly **Billed yearly	*$2.50 off-peak Additional plans available	

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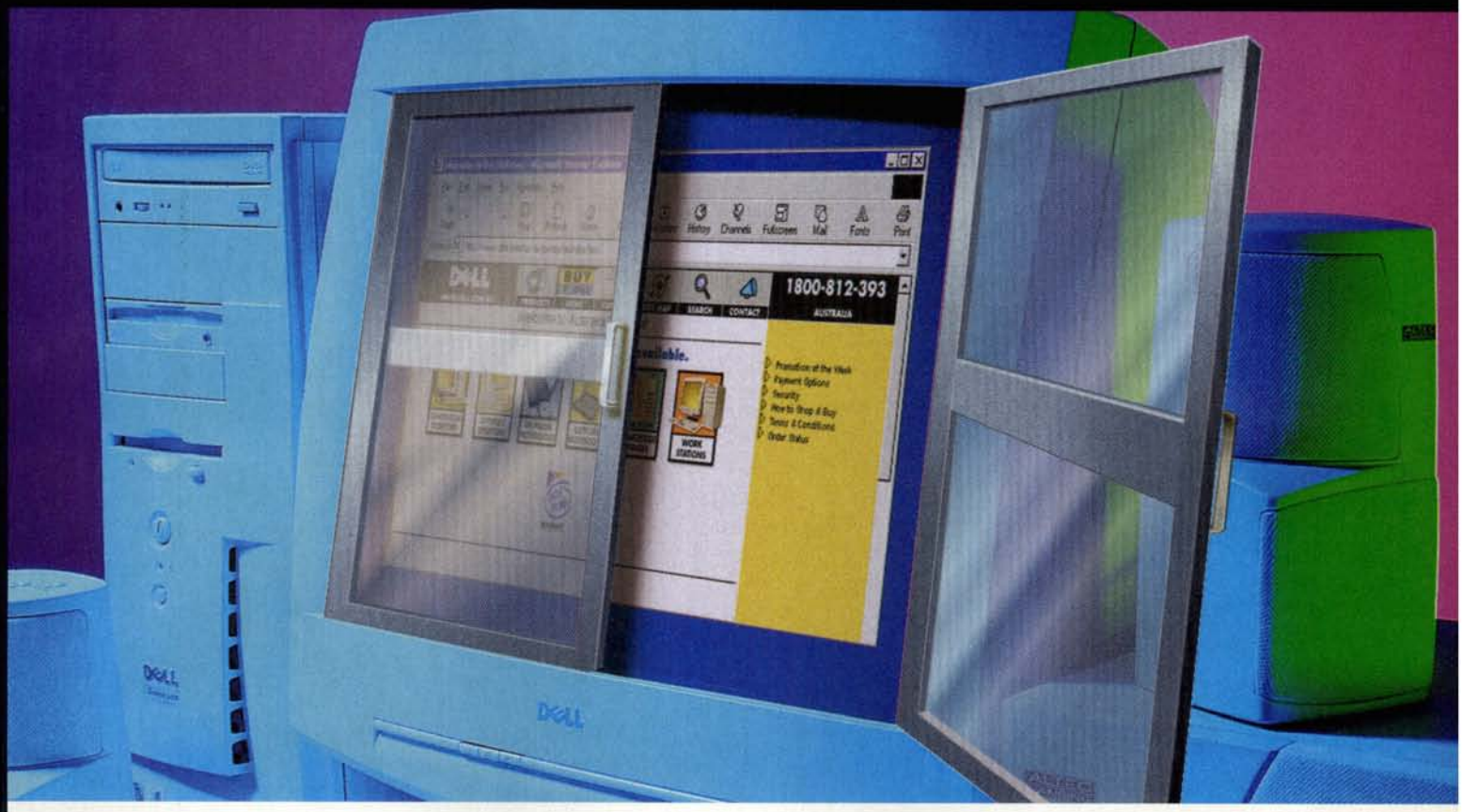

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Specifications: ISPs

ISP	Switch Telecommunications	Telstra Big Pond Home	TIG	TPG Internet	Zip World
Phone	1800 641 934	1800 804 282	1800 353 700	(02) 9850 0800, 1300 360 855 (sales)	(02) 9253 5777
Online	http://www.switch.net.au/	http://www.bigpond.com/	http://www.ihug.com.au/	http://www.tpg.com.au/	http://www.zipworld.com.au/
Maximum connect speed	56K	56K (Flex, to be upgraded to V.90)	56K (Flex)	56K (Flex)	56K (Flex)
Tech support times and fees	7 days, 24 hours, no fees	7 days, 8am to midnight AEST, no fees	Monday to Saturday 9am to 10pm, no fees	Monday to Friday 9am to 8pm (AEST), $2 per minute	Monday to Friday 10am to 8pm, no fees
Number of POPs	5	55	3	50	7
Network links	4.5Mbps combined Zircon, Global One, Access One/OzEmail, Connect, satellite	Did not disclose	1 to 2Mbps to Telstra Internet, 45Mbps to IHUG New Zealand	4Mbps to Telstra Internet	2Mbps to Telstra Internet, 2Mbps to Connect, 2Mbps to Optus, 10Mbps to TIG
International POPs	None	Available Q4 1998	12 POPs in New Zealand through ihug.co.nz	None	None
Pricing plans					
Plan 1: Set-up fee	None*	None	$49	$30*	$50
Monthly fee	None	$9.90	$25.95	$19.95	$39
Hours per month	None	3	Unlimited	150M downloads	150
Additional hours	$4 per hour	$5	N/A	N/A	$2.50
Web space	None	5M	5M	10M	5M
Plan 2: Set-up fee	None	None	$49	$30	$50
Monthly fee	$29.95	$35	$20	$120 for 120 hours**	$29
Hours per month	50	20	30	10	40
Additional hours	N/A	$4	99 cents	N/A	$2.50
Web space	None	5M	2.5M	10M	5M
Plan 3: Set-up fee	None	None	$49	$30	$25
Monthly fee	$39.95	$50	$15	$240 for 240 hours**	$9.95
Hours per month	100	30	20	20	Midnight to midday*
Additional hours	N/A	$3.50	$2	N/A	$2.50
Web space	None	5M	None	10M	None
Plan 4: Set-up fee		None	$49	$30	
Monthly fee		$80	$20	$300 for 600 hours**	
Hours per month		50	10	50	
Additional hours		$3	$2	N/A	
Web space		5M.	None	10M	
Plan 5: Set-up fee		None			
Monthly fee		$44			
Hours per month		150*			
Additional hours		$3			
Web space		5M			
Notes	*Email access only	*Conditions apply Additional plans available		*Available in Sydney, Melbourne, Adelaide, Brisbane and Canberra, credit card billing only **Over a maximum of 12 months Additional plans available	*Unrestricted access between midnight and midday

* Source: Individual ISPs. *APC* takes no responsibility for inaccurate information provided, and readers should check with ISPs for the latest details of pricing and services offered.

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Sure, performance is one indicator of a good ISP, but if the customer service stinks and you can't get anyone in tech support to answer your emails, is joining that provider worth the hassle? ***By Roulla Yiacoumi***

Your ISP's service: How does it rate?

Are you happy with your ISP's customer service? Do you get your problems resolved in a reasonable time? What made you leave your last ISP to go in search of another?

These are some of the questions we put to you in our ISP Service & Reliability survey 1998, published in our August 1998 issue. We received just under 2,000 responses, and this month we bring you the results of that survey. We tell you which ISPs, according to our readers, were the best and worst of the bunch. We report which ISPs provided the best connection in the business. And we reveal the ISPs that lost users to other providers and why.

In next month's Service & Reliability column, we'll bring you some reader comments — both good and bad — from our ISP Service & Reliability survey 1998.

How readers chose their ISP

On page 146, our table tells you what percentage of *APC's* readers were using which ISPs. The top five, in order, are Telstra Big Pond Home, OzEmail, One.Net, Access One and TIG. As you will see from our later analysis, high numbers don't necessarily mean happy users. In fact, our results show that the more customers an ISP had, the higher the proportion of unhappy users it had!

The majority of users (30.8%) had been with their current ISP for less than six months, reflecting the high churn rate of the industry and the rapid growth of new users joining ISPs for the first time. Just over 15% had been with their ISP for more than two years.

Word of mouth proved to be the most popular way users chose their ISP (36.2% of respondents). ISPs such as PowerUp and iinet had figures closer to 60%.

Advertising also made an impact here, with an average of 25% of users selecting their ISP from a magazine, newspaper or online promotion. The standout in this group was One.Net, an ISP with very aggressive advertising. A whopping 52.6% of its users joined One.Net as the result of seeing an advertisement.

Telstra Big Pond Home and OzEmail were the two ISPs which earned most of their users as a result of reading a review in a magazine, newspaper or online. Their figures were closer to 20%, as opposed to the 7.3% average.

How users chose their ISP	
A friend recommended it	36.2%
I saw an advertisement in a magazine/newspaper/online	25%
I read a review in a magazine/newspaper/online	7.3%
I conducted a search on the Web	5.2%
I saw the ISP at a trade show or similar	2%
Can't remember	4%
Other responses	20.3%

The other prominent figure here was the number of people who selected an ISP from a trade show. The average was 2%, but OzEmail more than tripled this, and Microplex's result was more than five times this figure.

Customer support

Any ISP not providing good customer support is kidding itself if it thinks it can survive in this climate. Over 80% of respondents said they had contacted their ISP's customer support — most of them by telephone.

Have you ever contacted your ISP's customer support?	
Yes	82.2%
No	17.8%

'Technical difficulties' was the most frequently given reason for contacting customer support (54.23%), followed by 'Could not access my email' (16.4%). But it seems One.Net users have more difficulty than most accessing their email, with a whopping 37.1% saying this was why they had to contact customer support. One.Net also rose to prominence in the billing problems stakes. While 10.3% of all users contacted their ISP to question a billing issue, One.Net's figure in this department was 32%.

Reasons for contacting customer support*	
Technical difficulties	54.3%
Could not access email	16.4%
To inquire about pricing plans and services	14.9%
To help set up account	13.2%
Billing problem	10.3%

*Respondents could tick more than one answer

Overall, users were happy with their ISP's customer support. The best ISPs for customer support were Netspace, iinet and Big Pond.

However, while most users were quite happy, over 10% described the support provided by their ISP as 'poor' — and some ISPs even had a much higher dissatisfaction rating. An overwhelming 39.2% of readers described One.Net's customer service as 'poor', and Microplex (26.1%) and TIG (21.7%) were not far behind.

How would you describe your ISP's customer support?	
Excellent	41.4%
Very good	25.7%
Satisfactory	12.6%
Good, but could have been better	8.7%
Poor	11.4%
Don't know	0.2%

The same three ISPs lagged behind when we asked readers if they thought their problem had been resolved in a reasonable time. On average, 81.8% said their problem was resolved efficiently and 16% said it hadn't (the remaining 2.2% weren't sure). But a substantial 46.4% of One.Net users said the problem wasn't resolved in a reasonable time, as did 32.6% of TIG users and 30.4% of Microplex customers.

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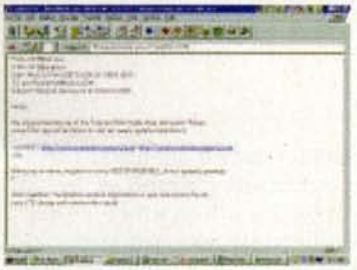

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Changing ISPs

It's no secret that there is a high customer turnover rate, known as 'churn', in the ISP industry. Customers will go where the best prices are, where the best customer support is, and where the most stable connections can be found. Most of the time, however, the final choice will be a compromise of all three of these features.

Our research found almost 70% of ISP customers had changed providers for a variety of reasons.

Have you ever changed ISPs?	
Yes	69.5%
No	30.5%

Most users changed ISPs because they thought their provider was too expensive, while an equally high proportion found an ISP which offered better value for money. These two statements do not mean the same thing. For example, if you were paying $20 a month for five hours' access, then switched to an ISP which offered 10 hours' a month for $20, this does not mean that the first ISP was too expensive — only that the second ISP offered better value for the same money.

Reasons for changing ISPs*	
Too expensive	40.7%
Found better value for money ISP	37%
Poor access and performance	36.2%
Poor customer service	25.5%
Too many busy lines in peak times	24.2%
Incorrect billing/unauthorised credit card charging	11.4%
I moved state/country	5%
I left the place I had a free account	4.6%
The ISP went bust	4.5%
Other responses	14.1%

*Respondents could tick more than one answer

When it came to giving ISPs a rating for overall service and value for money, PowerUp, Netspace and iinet scored highly, while the three worst were One.Net, TPGI, and Microplex. Our table on page 146 tells you how *APC* readers rated the main ISPs in this roundup. ISPs listed in this table featured in more than 1.5% of reader responses.

What readers said

- The worst ISPs in terms of incorrectly billing users or charging their credit card in an unauthorised manner were MSN (no longer operational), OzEmail, Access One, One.Net and TPGI.
- The ISPs considered too expensive by most users were Telstra Big Pond, OzEmail, CompuServe and Magna Data.
- 75% of users who left One.Net did so because of poor access and performance, while 53.6% left citing poor customer service.
- After One.Net, our readers tell us the following ISPs have the poorest access and performance: TIG, PowerUp, EISA
- Zip was the only ISP to have most of its customer service queries come in the form of email rather than telephone calls.
- Many comments received about One.Net were negative, however 48.3% of its users had stuck with the ISP for between six months and a year — a figure higher than both Telstra Big Pond and OzEmail combined. This suggested users were prepared to put up with poor access and customer service if the ISP had a cheap plan.

Complaining about your ISP

If your ISP is giving you problems, there is someone who can help you: the Telecommunications Industry Ombusdsman (TIO). The TIO is an office of last resort for you to lodge your ISP complaint with. This means that you must try to resolve the problem with your ISP first and you will need to provide proof of this to the TIO.

All ISPs must be members of the TIO — as stated in the Telecommunications Act 1997. There is no cost for ISPs to join the scheme. However, a fee will apply if a case is raised against the ISP, and if it is not resolved, the case escalates and the ISP is liable for paying a greater amount. It is therefore in the best interests of the ISP to resolve such issues at the earliest stage possible.

Complaint level	Amount ISP pays
Inquiry	$15
Consultation	$140
Complaint	$292
Dispute	$1,130

According to the TIO, 93% of cases are resolved at inquiry stage. The TIO can be contacted on 1800 062 058 or http://www.tio.com.au/.

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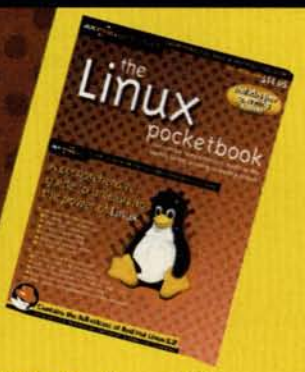

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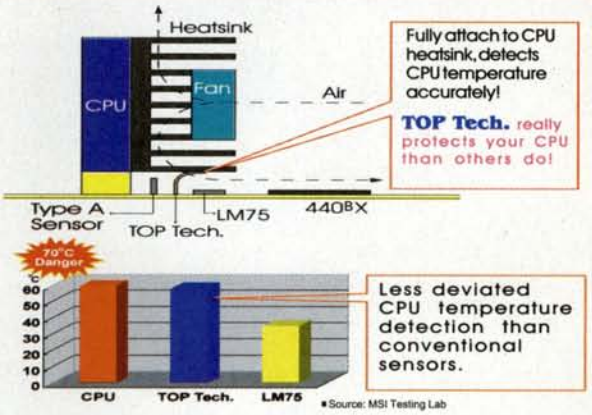

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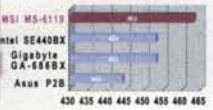

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What *APC* readers say about their ISP

ISP	Telstra Big Pond Home	OzEmail	One.Net	Access One	TIG	PowerUp
Percentage of *APC* readers using this ISP	11.7%	7.6%	6.6%	4.8%	3.5%	2.4%
Most users have been with this ISP for this long	Less than 6 months	Less than 6 months	6 months to 1 year	Less than 6 months	Less than 6 months	1 to 2 years
Most users chose this ISP this way	Advertisement in a newspaper/magazine/online	Advertisement in a newspaper/magazine/online	Advertisement in a newspaper/magazine/online	Friend's recommendation	Friend's recommendation	Friend's recommendation
Most users have this type of pricing plan	Monthly charge which includes set hours/downloads	Monthly charge with unlimited use	Monthly charge which includes set hours/downloads	Monthly charge which includes set hours/downloads	Monthly charge with unlimited use	Monthly charge which includes set hours/downloads
This percentage of the ISP's users described their connection as either very good or excellent	81.6%	68.7%	27.6%	69.1%	50.8%	78.6%
This percentage of users have contacted the ISP's customer support	74.8%	79.1%	83.6%	71.4%	75.4%	85.7%
In the last incident, most users contacted customer support by this means	Telephone	Telephone	Telephone	Telephone	Telephone	Telephone
Most users contacted customer support for these three reasons (in order)	Technical difficulties, to enquire about different pricing plans and services, to help set up account	Technical difficulties, could not access email, set up account	Technical difficulties, could not access email, billing problem	Technical difficulties, to enquire about different pricing plans and services, could not access email	Technical difficulties, billing problem, to enquire about different pricing plans and services	Technical difficulties, to help set up account, billing problem
Most users described customer support as	Excellent	Excellent	Poor	Excellent	Satisfactory	Excellent
Percentage of users whose problem was resolved in a reasonable time	89.6%	70.8%	48.5%	85%	63%	94.4%
Percentage of this ISP's users who say they've used another ISP previously	67.5%	65.7%	82.8%	72.6%	80.3%	50%
Number of users who once used this ISP but then left	258	252	73	71	28	N/A
The main reasons given for leaving this ISP	Too expensive, found better value for money	Too expensive, found better value for money	Poor access and performance, poor customer service	Too expensive, found better value for money	Poor access and performance, poor customer service	Poor access and performance, too many busy lines in peak periods
Most users joined their current ISP because of this problem with their last one	Poor access and performance	Poor access and performance	Too expensive	Too expensive, poor access and performance	Better value for money elsewhere	Too expensive
The percentage of users who rated overall service and value for money between 8 and 10	58.3%	56.8%	25%	59.6%	52.5%	92.8%
The percentage of users who rated overall service and value for money at 5 and under	16%	14.1%	36.1%	16.8%	13.1%	2.4%

*Source: *APC* ISP Service & Reliability Survey 1998

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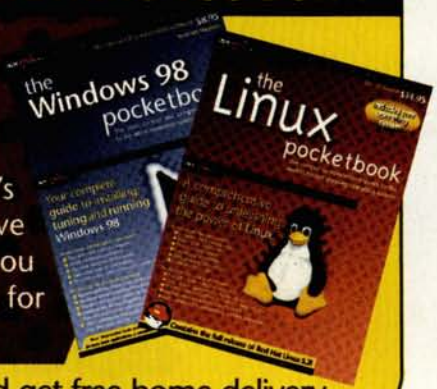

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Most users have this type of pricing plan	Annual account	Monthly charge with unlimited use	Monthly charge which includes set hours/downloads	Prepaid block of time	Prepaid block of time
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This percentage of users have contacted the ISP's customer support	81.8%	87.1%	76.7%	73.3%	88.5%
In the last incident, most users contacted customer support by this means	Telephone	Telephone	Email	Telephone	Telephone
Most users contacted customer support for these three reasons (in order)	Technical difficulties, to help set up account, billing problem	Technical difficulties, could not access email, billing problem	Technical difficulties, to enquire about different pricing plans and services, could not access email	Technical difficulties, billing problem, could not access email	Technical difficulties, to help set up account, to enquire about different pricing plans and services
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The main reasons given for leaving this ISP	N/A	N/A	N/A	Poor access and performance, too many busy lines in peak periods	Found better value for money, poor access and performance
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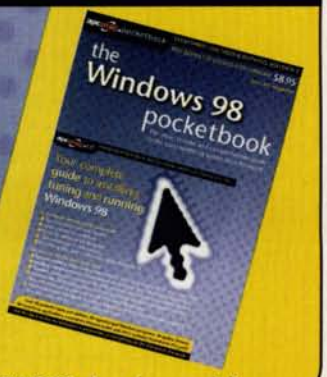

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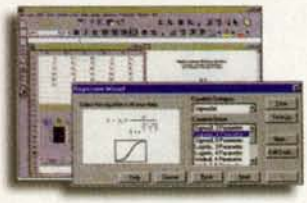

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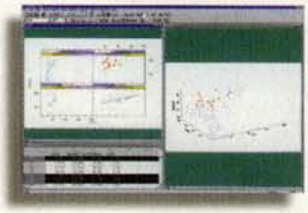

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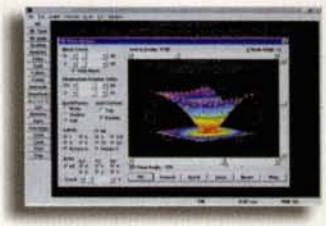

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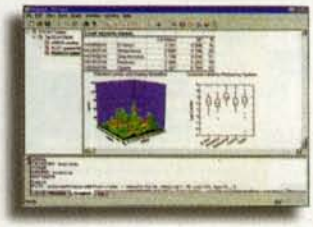

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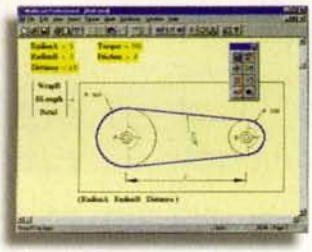

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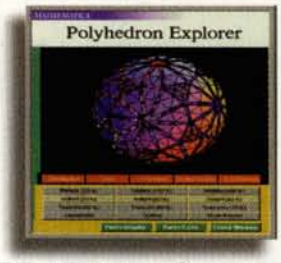

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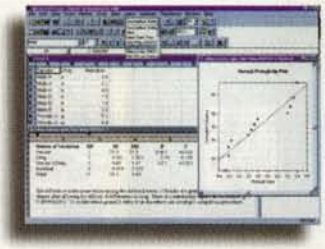

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Workshop

Welcome to Workshop, the section dedicated to bringing you all manner of tips, interesting information and do-it-yourself tutorials. Within these pages you will find useful shareware, informative operating-system-specific columns and easy-to-follow programming tutorials.

Although November's Bug of the Month is really a feature, we are still on the lookout for interesting anomalies — and there are plenty of prizes still to be won.

The *Linux Pocketbook* is on sale this month, and provides all the tools and information you need to get started with this popular operating system. The cover CD features the full release of Red Hat Linux 5.2, so you'll be ready to go. And if you are about to upgrade to Windows 98, the *Windows 98 Pocketbook* is still in the shops. Remember, Pocketbooks leave out the fluff and flannel and concentrate on the essentials to get you up and working quickly.

Tech Talk 150

Technobabble looks at the various buses used in conjunction with graphics cards, while Step by Step cocks an ear in the direction of speakers.

Operating Systems 155

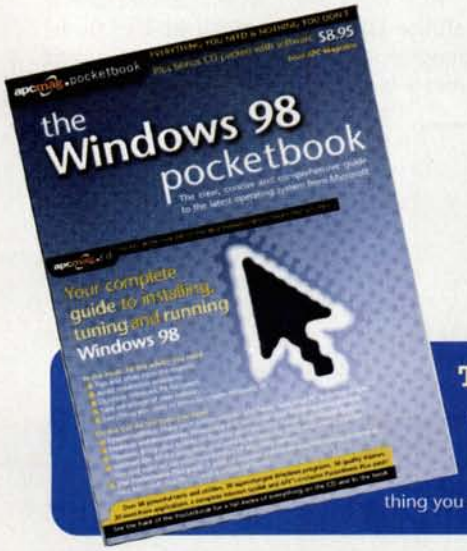
Windows 95 examines Plug and Play, OS/2 delves into directories and extended attributes, Mac OS revisits Contextual Menus, and Linux looks at FTP server setup.

Programming 170

Developers Corner reveals some of the tricks needed to create a demo version of a program, while HyperText revels in the relative freedom of an intranet.

Shareware Summary 176

All the files mentioned here can be found on this month's **apcmag.cd** in the Workshop section.



The Windows 98 Pocketbook

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Win! Win! Win!

Workshop is on the lookout for the most interesting, strange, funny, or downright weird software bugs you can find. These include code snippets, examples of features that function poorly, or procedures for crashing a particular application. Anything and everything that is buggy deserves mention.

Send us the bug of your choice via email to bugs@acp.com.au or snail mail, and you'll be in the running to win your choice of **development or application software** prizes from Workshop's software collection. The prizes change each month to ensure there's always something interesting for avid bug-hunters. Feel free to send screen captures or example code listings, as well as details of how to duplicate the bug, if applicable.

Winners will be announced in the January edition of *APC*, and the winning bug will appear in the Bug of the Month column. So start hunting!

Bug of the Month

The subject line of the email message screamed at me: IT'S A BUG!!! Do not ignore this message but check it out! How can you reject a plea like that? 'Sash', an avid reader of Workshop, try as he may, could not change the name of his file from 'Connect' to 'Con'. Why is it so?

Actually, if you are old enough to remember the source of the quote 'Why is it so?', you probably already know why. DOS defines a number of special filenames. One of these is 'Con', short for 'Console'. If, at the DOS prompt you type: COPY C:\AUTOEXEC.BAT CON, your AUTOEXEC.BAT file will be displayed on the screen (or console). You can also type: COPY CON SOMEFILE.DAT. This causes everything you type to be directed to the file SOMEFILE.DAT. Press Ctrl-Z to stop typing into the file. (Please don't type COPY CON C:\AUTOEXEC.BAT, as you'll overwrite your AUTOEXEC.BAT file and then blame me for it.)

As you might expect, Windows inherits these special filenames. Some of the other predefined files are:
com1, com2, com3, com4: serial ports
lpt1, lpt2, lpt3: parallel ports
aux: another name for com1
prn: another name for lpt1
nul: a bit bucket

For his trouble Sash receives a prize of his choice from Workshop's software archives.

Michael Smith

Get involved

All files mentioned in Workshop can be found on **apcmag.cd** or downloaded from our Web site at http://www.apcmag.com. You can join one of our online discussion forums where you can discuss technical issues or just voice your opinion on any related topic.

Workshop is a reader-input section. Send any ideas, comments or criticisms you have via email to workshop@acp.com.au, or send snail mail to *APC* Workshop, PO Box 37, Sydney NSW 1028.

In part two of our series on graphics cards we take a look at some of the bus, video and memory standards of the past and present. **By Nathan Taylor**

Technobabble

Last month we had a look at some of the basics of graphics cards. In this, part two of our graphics card series, we take a look at some of the standards, past and present, that are relevant to the graphics card industry.

Buses

The bus to which the graphics card is connected has become vitally important to the performance of the subsystem. In PCs, it all began with the ISA bus.

Back when the ISA bus was the only bus in PCs, this was the only bus that graphics cards could use. The problem is that the ISA bus is S-L-O-W. Operating at only about 8 to 11MHz, the ISA bus would be way too slow to handle today's modern graphics card demands, and it's rare to find an ISA graphics card except in old 286 and 386 computers.

Because of the low bandwidth afforded by the bus, ISA-based graphics cards can only support low resolutions and colour depths.

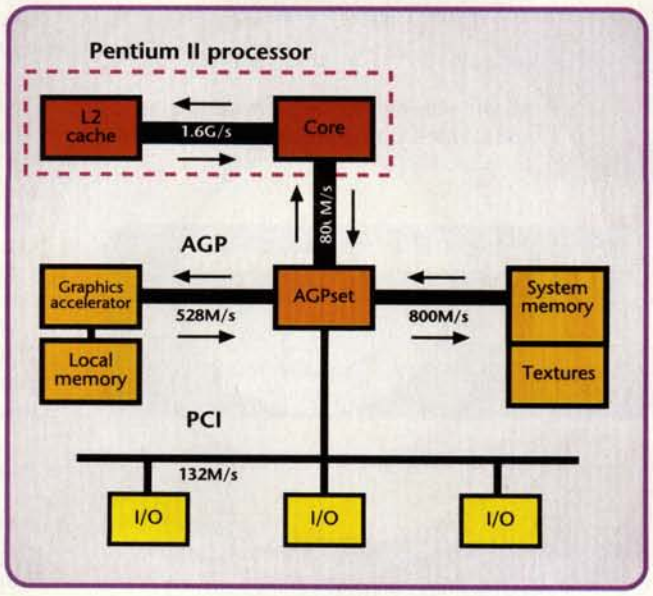
Seeing the problems with the ISA bus, the Video Electronics Standards Association (VESA) set about defining a new interface standard for video graphics that would allow higher resolutions and take the strain off ISA. Introduced in 1992, the VESA Local Bus (VLB) was the product of this development.

A 32-bit bus (as opposed to the 16-bit ISA bus), VLB was used primarily in 486 systems and some early Pentiums, but is little used today, having been shunted by the PCI bus. It provided performance far superior to that of the ISA bus, although not quite up to that of PCI.

Unleashed by Intel in 1993, PCI has since become the dominant system bus in newer PCs and Macs. PCI is a general-purpose bus, like ISA, but is many times faster, running at 33MHz (the specification actually allows for speeds up to 66MHz, but this has not been widely implemented). In terms of data rate, this roughly translates to 133M per second. This speed allows for much faster graphics cards than were available previously.

In the past few years, graphics, particularly 3D graphics, have begun to put a strain on even the PCI bus. For this reason Intel started developing the Accelerated Graphics Port (AGP) specification several years back, and now pretty much all new systems support the specification.

AGP is based on 64-bit extensions to the PCI specification, and allows bandwidth at least twice that of the PCI bus. It is also application specific — it does not support devices other than graphics, unlike the buses previously mentioned (for this reason AGP is technically a port, not a bus, because it creates a 1:1 connection with a processor, not a link between multiple devices).



Speed-wise, the AGP specification defines a number of modes: notably 1X, 2X and 4X. The first two of these are already implemented in system motherboards, while the latter is set to debut next year when Intel releases a chipset supporting the 4X specification. At its lowest speed, the 32-bit AGP bus operates at twice PCI speeds, simply because of its doubled clock rate (so it has a base rate of 266Mbps). The other modes, 2X and 4X, use special signalling techniques to double that speed for 2X and double it again for 4X — so the latter will reach speeds exceeding 1Gbps when it is released next year, eight times the speed of PCI.

AGP has other advantages. Because it defines a high-bandwidth link to main memory, AGP has a special mode that gives it the ability to 'borrow' some of the system's main memory for tasks that require a lot of graphics memory, such as storing textures for 3D graphics. This is designed to allow very detailed textures to be used in 3D graphics, as well as save some money on memory for graphics cards.

Video standards

The earliest PCs didn't even support graphics — only text. And colour was beyond the wildest dreams of the computer pioneers of the time.

The original video standard was called the Monochrome Display Adapter standard, designed for early PCs which had only monochrome monitors (also known as 'green screens') and text-based graphics. It supported a screen of 80 by 25 characters (each character was nine dots wide and 14 dots tall), and no bitmap graphics were possible. IBM developed the standard for the original PC.

In the early 1980s a company called Hercules saw the need to provide graphics capabilities to PCs, and went ahead and developed an MDA which supported graphics as well as text. Called the Her-

cules Graphics Adapter, the device would help develop the PC market by allowing graphical applications — like spreadsheets — to be displayed on monochrome screens. Supporting 720 by 350 resolutions at 50Hz, the Hercules card was backward compatible with MDA, enabling the same monitors to be used with the card. The card was very popular in its time, and by the mid-1980s a number of Hercules clones appeared.

It was left to IBM to develop a standard for colour graphics on PCs, and its first effort was its 16-colour color graphics adapter (CGA). CGA supported a resolution of 640 by 200 at 60Hz, and had a text-only mode supporting 80 by 25 characters (but the characters themselves were only eight by eight pixels). The strange resolution of CGA makes it look odd on modern monitors — the pixels were quite a bit wider than they were tall.

The subsequent introduction of IBM's enhanced graphics adapter (EGA) made the company's own CGA standard obsolete. EGA supported higher resolutions (640 by 350), and more colours. Unlike CGA, which had a fixed palette of 16 colours, EGA supported 64 colours, although only 16 could be displayed on the screen at the same time. Many 286es used and still use EGA graphics, and this was the baseline support required for Windows 3.x to operate.

At a time when everything else was going digital, monitors were travelling in the opposite direction. All the standards we mentioned above were actually digital standards, not analog, as were used in television. The problem with this, however, was that digital signalling meant that only a finite number of colours could be transferred to the monitor. As a result, IBM decided to move to analog signalling for its PS/2 line of PCs, and developed a new standard called video graphics array (VGA). VGA's analog signalling technique would allow practically infinite variations of the red, green and blue values to be transmitted to the monitor, for far greater colour transmission.

VGA forms the 'baseline' of graphics support in modern PCs, and all modern cards support the standard. VGA originally supported two modes: 640 by 480 at 16 colours, or 320 by 200 at 256 colours. These colours could be chosen from a potential palette of about 260,000 colours, as true VGA uses 6 bits to specify the value for each colour (red, green and blue).

VGA included no acceleration features; the standard only defined a means by which the processor could write directly to the frame buffer, and how that was to be transmitted to the screen.

Common resolutions

Most monitors support a given set of resolutions and refresh rates defined in the VESA standard, the most common of which are as follows:

Resolution	Aspect ratio	Common name
320 by 200	8:5	VGA
640 by 480	4:3	VGA
800 by 600	4:3	SVGA
1,024 by 768	4:3	XGA
1,280 by 1,024	5:4	-
1,600 by 1,200	4:3	-
1,920 by 1,600	6:5	-

Note: The commonly used descriptive term is not technically accurate — VGA, SVGA and XGA describe colour depth as well as resolution — but this is the way in which many marketing documents will describe a given resolution (for example, "this notebook screen is capable of XGA resolutions").

You'll also note that the aspect ratio is not consistent across all standard resolutions. In particular, 320 by 200 and 1,280 by 1,024 are not the standard screen 4:3 ratio. Fortunately, monitors (which themselves are usually 4:3) have special chips in them to deal with these aspect ratios, converting them to 4:3 for full screen display without warping images.

After VGA, the days of graphics standardisation pretty much came to an end. With the decline of IBM as *the* PC vendor, many clone manufacturers began to go their own way, and many different graphics cards with different capabilities have since been released. All support VGA, but beyond that there is little similarity in the communication modes and acceleration features.

Still, resolution (but not interface) standards have been widely accepted. The one most often referred to is super VGA (SVGA), commonly used as a way to describe resolutions greater than those supported by VGA, such as 800 by 600. A later resolution description was the Extended Graphics Array (XGA), technically a type of adapter used in later PS/2 models which supported 1,024 by 768 at 256 colours, but commonly used to refer to any card which can achieve that resolution.

It wasn't until VESA stepped in with VBE (VESA BIOS Extensions, see *APC* October, page 142) that we had a real set of standards for resolution and display of graphics.

Video memory speed and features

Memory speed is important for the frame buffer to be able to deliver screen information to the RAMDAC (see *APC* October, page 142) fast enough for it to be displayed on the screen. Recently, it has also become important for 3D graphics, so that 3D data can be passed to and from the graphics processor quickly enough for 3D scenes to be generated.

The memory speed required varies, based on the resolution, refresh rate and colour depth of the scene. At 320 by 200 with 8-bit colour and a 60Hz refresh rate, a memory speed of only 3.8M per second is required. At the other end of the spectrum, at 1,600 by 1,200 with 24-bit colour and a refresh rate of 85Hz, for instance, this memory requirement goes up to 489.6M per second.

While earlier cards used standard system RAM, modern cards require faster RAM to achieve high resolutions and refresh rates. Standard EDO or SDRAM memory, for instance, could not achieve the 489.6M per second rate required to go to the highest resolutions. To this end, a number of other RAM technologies have been developed for graphics cards.

The most common is currently synchronous graphics RAM (SGRAM), a high-speed variant of SDRAM. SGRAM meets the requirements of most graphics cards, and is relatively cheap to manufacture. Other variants include video RAM (VRAM) and Window RAM (WRAM), which use a technique called 'dual porting'. With normal RAM, the processor and the RAMDAC have to take turns to access the RAM — the former to write to it, the latter to read from it. Dual porting allows both to access the RAM simultaneously. Other RAM types, such as Multibank DRAM (MDRAM) and 3D RAM, use similar combinations of multiporting and speed improvements.

Next month: A peek into the wonderful world of 3D graphics.

Almost every PC these days has high-quality 16-bit audio output. So why is computer sound generally lousy? **By Daniel Rutter**

Step by Step

There are three basic factors that determine the quality of what you can hear from your home hi-fi or PC — source quality, amplification noise and distortion, and speaker quality.

What you *do* hear at the end of all this is limited by the quality of your hearing, which in youngsters covers a frequency range of roughly 20Hz to 16kHz, with high frequency response dropping off steadily as you age. Each musical octave represents a doubling of frequency.

The source

Audio quality for computers varies. Most PCs have a Sound Blaster 16 or similar soundcard installed, which means they can play digitised sound with 16 bits per sample at very high sample rates. The more bits per sample there are, the more finely the digitised sound can follow the original analog waveform. Sixteen bits are generally accepted to be enough. The more samples per second there are, the higher the maximum reproducible frequency, which is half of the sample rate. CD quality is 16-bit stereo at a 44.1kHz sample rate, giving a maximum reproducible frequency of 22kHz, well above the highest threshold of hearing.

This doesn't, however, mean your soundcard will be playing audio of this quality — most digitised computer sound is considerably less than CD quality, because lower quality takes up less space and processor power. An eight-bit 22kHz explosion sounds very nearly as good as a 16-bit 44kHz one.

The sound quality of MIDI music can vary enormously between soundcards. The old-fashioned FM synthesis used by the bog-standard SB16 mentioned above and many other cards sounds tinny and unnatural. Wavetable synthesis, the standard on classier soundcards, uses digitised samples of real instruments for its sounds, and the result is as good as the samples allow — a wavetable card with plenty of memory for its samples can sound very realistic. Soundcards featuring 'physical modelling' use onboard hardware with more grunt to actually imitate the sonic behaviour of a real instrument, and can sound the best of all. They can also be reprogrammed to produce an amazing variety of sounds.

Any PC with a correctly connected CD-ROM drive can play CD audio. The quality of the CD audio has little to do with the quality of the soundcard, because it's played by the CD-ROM drive, not the card. The card just channels (and amplifies, unless you're using line-out) the analog signal from the CD-ROM. CD audio played through the computer is therefore generally just as good, for all but hi-fi purist golden-eared types, as the same audio played through a dedicated audio CD player. Computer CD-ROM drives often deal poorly with scratched CDs, and the soundcard amplifier (if you're using it) can add noise and distortion, but by and large CD audio sounds great.

Inadequate amps

Amplification noise and distortion can be high in PC applications. If you have powered speakers, they'll have their own amplifiers built in and these are often very cheap and nasty. If your speakers are unpowered, you'll need a soundcard with an onboard amplifier (any soundcard with a 'speaker' as opposed to 'line' level output has an amplifier), and onboard amps are usually lousy, too. But this is less of a problem than you'd think — given the raucous nature of most computer sound, quite high amplifier distortion figures are not noticeable.

Small, cheap amplifiers also have lousy signal-to-noise figures — since computers are electromagnetically very noisy, cheap soundcards and speaker amps often pick up interference from the computer. This expresses itself as hiss and other semi-random sounds, which are audible during quiet moments. Again, this is no big deal for most users, as most computer sound is well above this 'noise floor'.

A selection of speaker 'drivers', the actual sound-producing units. Clockwise from top left, there's a pair of 4in units as found in cheap car stereos and larger budget-priced computer speakers; a couple of 4in magnetically shielded drivers as used in computer and television speakers; a couple of nasty little 3in drivers as found in any number of computer speakers, and a pair of vastly superior carbon fibre 4in units with far better power handling and, as you can see, much bigger magnets. Better computer speakers have drivers of this calibre, but you have to spend a few hundred dollars to get them. These last speakers retail for around $40 each, and handle 15W RMS; the others cost, at most, $5 each retail, and handle 2W to 3W.

Fix the speakers!

By far the most important limiting factor in most computer audio and hi-fi applications is the quality of the speakers. The speaker in the average TV puts most PC speakers to shame.

A lot of terminology is shared between computer audio hardware and hi-fi gear — especially the lower end, appliance-store kind of hi-fi, which purists tend to refer to as mid or lo-fi.

First, there's power handling, which is how much power you can put into a speaker before it blows up. A speaker with higher power handling is not necessarily louder. If all other things are equal, the higher power speaker can be wound up louder, but if the lower power speaker is more efficient, you'll get more sound out of it for less power input. The statistic to look for is a 'watts RMS', which is the Root Mean Square or, in English, 'real' power rating. Peak or Peak Music Power Output (PMPO) ratings are all lies. The standard soundcard amplifier puts out about 2W per channel RMS.

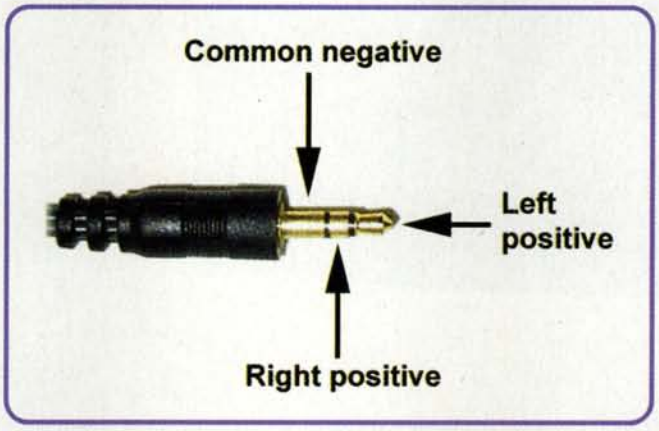
Efficiency is one of the things you should look for ahead of power handling in a computer speaker. It's expressed in decibels (dB), generally as the output sound pressure measured at 1m for 1W of input power. The decibel is a logarithmic measure, so a 3dB difference is a twofold power difference — to get 3dB louder you need twice as much power. High-end computer speakers might actually have efficiency listed on the spec sheet; cheaper gear will have no numbers or some rather optimistic ones. For reference, a symphony orchestra at full fortissimo and heard from a good seat is about 90dB. Ninety decibels from 1W at 1m is on the high side for hi-fi speaker efficiency, but from 2W at closer range, as is usually the case in computer applications, 90dB is thoroughly attainable. For every doubling of distance you need another 6dB to maintain the same sound level.

By and large, the larger the drivers (the cone-shaped things that make the noise in the speakers), the more efficient the speaker will be. Yes, that does mean that a hi-fi speaker with a 12in bass driver will be a lot louder for the same input than a PC speaker with a 3in driver.

With a reasonably efficient speaker, a weedy little 2W soundcard amplifier is more than adequate for room-filling sound. As a matter of fact, most hi-fi listening is done at power levels well below 5W per channel.

The other important statistic is frequency response, which is another thing about which cheap speaker specifications usually lie. Most adults can't hear above 14kHz, but that's not where the lies are. Cheap speakers tell fibs about their bass response.

No matter what a cheap 3in driver's specifications say, it has no useful response below 120Hz, and probably bog-all below 200Hz. Yes, it will make a noise if fed a 50Hz tone. But it's so inefficient at that low frequency that it'll barely be audible, even at full power. If you want real response below 100Hz from small speakers (most bass drums are about 60Hz, and engine rumbles and explosions can have much lower components), you have to augment them with a subwoofer of some kind.



Identifying the terminals on the standard one-eighth-inch stereo.

Or just use bigger speakers.

If you've got a spare pair of speakers sitting around — hi-fi, boom box, whatever — they're certain to sound as good as anything you spend $50 for at a computer store, and probably a great deal better. If your soundcard has an amplifier, all you'll need is a cable to connect the soundcard to the speakers. Most speakers have terminals which accept bare wire. Knocking up an adapter cable from the standard soundcard one-eighth-inch stereo headphone-type jack to bare wires is a minor job for anyone at all handy with a soldering iron — refer to Figure 2 to identify the terminals on the plug.

If you've any talent for woodwork, you can easily make your own speakers, with cheap drivers, terminals and other accessories from an electronics store and a few dollars' worth of wood.

Headphones are another option. If you don't mind the inconvenience, $150 spent on headphones will give you much better sound than the same amount spent on speakers.

The coming thing

USB (Universal Serial Bus) speakers plug into the USB connectors on current computers (Windows 98 supports USB devices), and accept digital audio data from the computer, which they convert to sound with built-in digital-to-analog converters. This means you need no soundcard at all as long as you only want audio output, not input, and it also makes possible fancy multispeaker setups, with complex positional audio handled by the CPU or a dedicated audio processor. At the time of writing, though, the only USB speakers available are just basic stereo. So unless you're really scratching for slots and system resources, you might as well stick with your standard soundcard.

Shielding

Magnetic shielding is important if your speakers are going to be right next to your monitor. Since monitors use a magnetic field to aim their scanning electron beam, and speakers use large permanent magnets to give their electromagnetic voice coils something to push against, putting a magnet near a monitor can cause effects ranging from slight image skewing to serious colour distortion, which in extreme cases can only be cured by the use of a special degaussing wand.

Unfortunately, magnetic shielding generally involves using very small driver magnets, or sandwiching a reversed magnet onto the back of the main one, both of which make the driver less efficient. Since magnetic fields fall off very rapidly with distance, you can use any old speaker as long as it's a reasonable distance from your screen.

My own 'computer' speakers have monster 15in bass drivers with totally unshielded 1.5kg magnets, and one of them is barely 60cm from my monitor. The screen image is very, very slightly skewed anticlockwise, and that's the extent of the perturbation.

You don't have to go as far over the top as me (by the way, my amplifier has four cooling fans). For not much money, you can get a whole lot of sound.■

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Mmmm, Plug and Play. A great idea. Pity it doesn't always work like it's supposed to. **By Kieran McNamee**

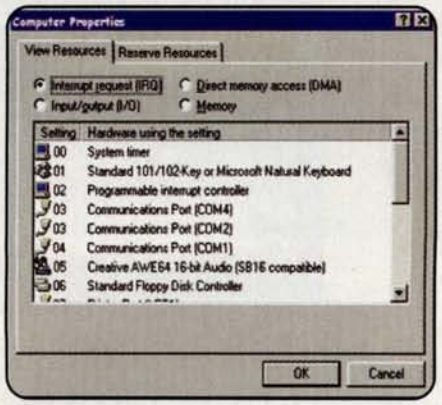
Windows 95

What is Plug and Play?

Simply stated, plug and play refers to the ability of a computer to automatically detect and then configure a peripheral device so that it works with the rest of the system. In theory, all the user has to do is plug in the device, then the rest of the installation is performed by the computer.

Remember the days when installing a device could take minutes or, more likely, a number of painstaking hours? With Plug and Play, we no longer have to wrestle with IRQs, DMAs or I/O addresses. Macintosh users will laugh when they read this article because they've had plug and play capabilities since the introduction of the NuBus. You must realise, however, that there are relatively few manufacturers of Mac components compared to the many thousands of PC equipment manufacturers. Standardisation of components would make installation a simple affair but with such a range of components to choose from, PC users have had to endure the uncertainty involved with buying and installing a new piece of hardware.

Sceptical PC users out there will already be familiar with the term 'plug and pray'. This may be true at times, but Plug and Play technology has done a lot to improve the installation of peripheral devices. Plug and Play may not always work as it is supposed to, however there are methods that can be used to give any troublesome devices that little push along. We will look at troubleshooting those kinds of installations in a little while.



As mentioned earlier, plug and play is by no means a new idea. The PC's implementation of plug and play finds its main roots with the Enhanced Industry Standard Architecture (EISA) bus from the late 1980s. Before EISA, IBM had its own Microchannel Architecture (MCA) bus. Unfortunately neither EISA nor MCA were able to establish themselves as a standard, and so the problem of torturous hardware installation continued.

Plug and Play promised many benefits for manufacturers as well as consumers. If consumers were able to install components relatively painlessly, they would be likely to purchase more of them. With hassle-free installations there would also be a decrease in the number of tech calls required by disgruntled purchasers.

When Plug and Play was introduced with Windows 95 there were four companies promoting it: Microsoft, Intel, Phoenix and Compaq. Microsoft had the operating system, Intel the chips, Phoenix the BIOS, and Compaq was building it. Now, Plug and Play is looked after solely by an independent regulatory group called the Plug and Play Association.

A complete Plug and Play system consists not only of Plug and Play-compliant hardware but also of a Plug and Play BIOS, motherboard and operating system. These have been pretty much standard fare for any PC purchased in the past few years. Legacy devices, or those that are not Plug and Play compliant, can still take advantage of some of the Plug and Play features but require a little more assistance during installation.

On booting, the BIOS looks after Plug and Play settings by using the Extended System Configuration Data (ESCD), the Configuration Manager (CM), and the ISA Configuration Utility (ICU). The processes involved with these components when new hardware is detected ensure that any legacy devices are looked after first, then the Plug and Play devices are configured with the remaining resources. Once this is done the plug and play process is passed on to Windows 95.

Plug and Play in Windows 95

Windows 95; the easy-to-use plug and play operating system. Or so they tell us.

On most occasions, Windows 95 will detect a new hardware installation and on startup will display the Add New Hardware wizard. If all goes according to plan you will have the required drivers installed and will be using your new device with a few clicks of the mouse.

The device driver is an important part of hardware installation. Windows 95 has many generic drivers for most components that allow them to be installed with basic features. It is a good idea to obtain the latest drivers from the manufacturer to ensure that you are getting the most out of your hardware and that there are no problems. Often, the fea-

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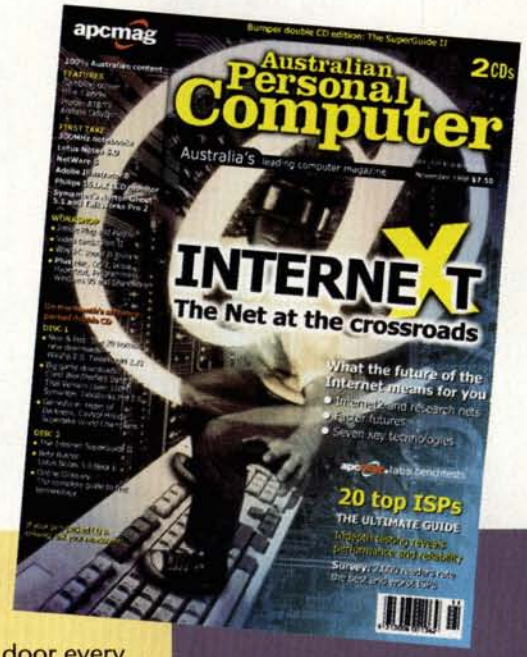

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tures and functionality of a device may be limited if a generic driver is used.

A major component of the Windows 95 architecture, and an integral part of the operating system's plug and play abilities, is the Configuration Manager. This component runs from the Virtual Memory Manager and manages the configuration of all system devices. Bus enumerators are called upon to provide information about the number and type of devices on the relevant buses. Specific information for these devices is then located and gathered from the BIOS or the previously installed device drivers. With this information the Configuration Manager then assigns the appropriate IRQ, DMA and I/O address settings to each device. Resource arbitrators are used to ensure that when a new device is installed there are no resource conflicts with existing devices.

The plug and play processes of Windows 95 and the BIOS are integrated. After Windows 95 makes any changes to the resource settings, the respective details are saved to the ESCD. This means that the next time the system boots, the BIOS will not override the settings that Windows 95 assigned to the device.

Besides the simplification of hardware installation, Plug and Play provides Windows 95 users with the ability to change system settings without the need to reboot. Windows 95 will detect when some devices are added or removed, and will reconfigure the appropriate resources. For example, monitors and game controllers can be interchanged without having to worry about restarting the system. Some laptops that can be connected to docking stations can have all of their settings changed automatically once they are plugged in; when they are unplugged the settings will revert to normal.

Plug and Play devices

Almost all devices sold today are Plug and Play compatible. For a device to be labelled Plug and Play compatible, or 'Made for Windows 95', manufacturers must submit them to Microsoft for official testing. Whether a manufacturer gains official Plug and Play certification or not is up to Microsoft, but the three basic design rules for a Plug and Play device are:

- It must be entirely configurable by software; no mechanical switches or jumpers are allowed.
- It must be able to uniquely identify itself to any inquiring software.
- It must be able to report to the system on the resources it requires to operate.

For more information on Plug and Play device specifications there are numerous documents available on Microsoft's Web site at http://www.microsoft.com/hwdev/respec/pnpspecs.htm.

Troubleshooting

Unfortunately, Plug and Play does not always work the way it's supposed to. Plug and Play-compliant devices will occasionally have difficult installations, but more often than not it is the legacy devices that cause the majority of problems. The more legacy devices that you have, the greater the chance of having resource conflicts.

Conflicting resources is the usual cause of troublesome hardware installations. In Windows 95, the quickest way to determine resource conflicts is by using the Device Manager, which is accessible from the System icon in the Control Panel.

The Device Manager lists all hardware connected to the system. If there are any problems, the affected devices are indicated with an exclamation mark. By viewing the details of problem-causing devices as well as the details for the entire system (click on the Computer icon and then the Properties button for details on all system settings), you can note down resource settings and figure out where the conflict lies.

With this information users who know their way around a PC can then go about manually configuring the device settings; however, be warned that if the wrong settings are chosen your system may not function correctly. Changing the settings for a legacy device involves changing the card's physical settings; changing the resource settings through the Device Manager does not change the jumper settings.

When it comes to manual selection of resources, your choice of IRQs and DMAs will be limited. Although Windows 95 allows you to change resource settings for legacy and Plug and Play devices, it will not let you select a resource that a device cannot accept. These unacceptable resources are 'locked' because they may be in use by legacy devices or other system equipment that require specific resources.

If Windows 95 has problems with detecting new devices it's a good idea to see whether the BIOS is having any problems with detecting the device. If the BIOS can't detect it then the operating system probably won't either. Looking closely at the BIOS messages on booting may reveal whether it has recognised the new device or not.

After entering the BIOS set-up screen, usually by pressing the Delete key at the beginning of bootup, there are a couple of things you can try to fix any problems. By ignoring the ESCD data, the BIOS can start from scratch, and go about detecting and configuring all Plug and Play devices again. Resetting the ESCD can be done by selecting an option in the BIOS like 'Reset configuration data' or 'Load CMOS defaults'.

The BIOS usually retains automatic control over the resource settings to be used for legacy and Plug and Play devices. By selecting a manual configuration you can choose which resources should be assigned to legacy devices, thus 'locking' them from use by Plug and Play devices.

If none of the aforementioned methods resolve your problem, then removing all Plug and Play devices and reinstalling them one by one may be the answer.

Plug and Play in the future

Windows 98 extends the Plug and Play technology found in Windows 95. Coupled with the new Universal Serial Bus (USB), many peripheral devices can be plugged in and set up without needing to reboot. The USB claims to remove all installation problems, however, problems may arise if devices are not plugged in correctly.

In Windows 95 Plug and Play is by no means perfect. One day, however, we may have an operating system that provides the same compatibility and easy installation as the Macintosh.■

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Navigating OS/2's directory structure and understanding EAs.

By Christopher Relf

OS/2 Warp

Don't be too confused by the huge number of directories and files OS/2 creates on your hard drive during installation — most of them are quite useful and configurable. If you've ever wondered what is actually in the X:\nowhere directory, read on . . .

Older operating systems like DOS were generally pretty easy to work out. One directory had all of the OS's required files in it, and you just about knew what every file did. In the days when an excessive hard drive was 40M, if you didn't think you needed the NIBBLES.BAS QBasic game, you could safely delete it — the same if you preferred the XCOPY command to COPY.

These days, the new generation of OSes (OS/2, Windows 9x, and so on) have a rabbit warren of directories and files all over the place (sometimes across several drives at a time). This web of data can often be confusing for the user, who, afraid of screwing up the workstation by deleting a file, may leave it alone altogether or, worse still, delete the wrong file.

OS/2 is no exception — a typical installation of Version 4 can generate more than 4,000 files in over 60 directories, a long way from the old one-directory DOS, and even the two-directory Windows 3.x days. Of course, if you install the BonusPak, there's even more.

So let's have a look at the main ones that keep OS/2 ticking.

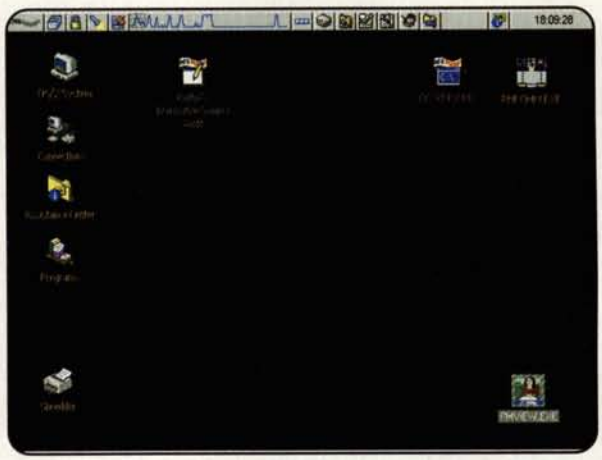
The root directory

The most obvious is the root directory. I won't assume it's C: as the majority of OS/2 users are computer literate enough to use several operating systems at once; so let's just call it drive X:. The root directory has only a few files in it (including the hidden ones) and they are generally used just to get OS/2 going. These files include OS2BOOT, OS2KRNL, STARTUP.CMD and the ever-popular CONFIG.SYS. Another frequently used file is the VDM (Virtual DOS Machine) file called AUTOEXEC.BAT.

If you have your hard drive partitioned using the OS/2 High Performance File System (HPFS), you can have filenames 25 characters long. But if you are using the old File Allocation Table (FAT) method you need to store your files in 8.3 format and the extended attributes (EAs) of each file (including long filenames) are saved in a file called EA DATA. SF. These files are usually hidden, and they live on every drive where you have saved a file with EAs, including floppy disks. So it's no surprise that there's one in the root OS/2 directory as well.

More about EAs

EA DATA. SF can hold up to 64K of information on files and directories. When using HPFS, the EAs are stored alongside the individual files. In more traditional systems, the type of application to launch a particular file is determined using that file's extension — a real problem if you have two applications that can, and want to, open files with the same extension. For example, both OS/2's Picture Viewer and Peter Nielsen's PMView are happy to open bitmap files. The idea now is that this information can (and hopefully will) be stored in the file's EAs.



How does it work? When you save a file in either DOS or Windows 3.x, there are two bytes left over, and OS/2 makes the best of them — they are used to store a number which is indexed into the EA DATA. SF file, and the appropriate EAs are stored alongside them. When OS/2 accesses a particular file and/or directory, its corresponding number is determined and the respective EA from EA DATA. SF is returned, if appropriate.

The \desktop

This directory is no longer a mystery to most people, but its use is. With the emergence of the Windows 95 X:\windows\desktop, the original OS/2 version makes a little more sense — items on your desktop are saved into the X:\desktop directory. Don't be fooled into thinking that all the icons on your desktop represent actual files and folders, because most don't. To conserve much-needed disk space (and to avoid ambiguity) OS/2 uses a file type called 'shadow' — what Windows 95 users would call a 'shortcut' and Macintosh users an 'alias'. The shadow icon simply points the computer to the location of the original file. So, if you have PMView on your desktop, it probably is just a shadow of the original PMVIEW.EXE executable in your \utilities\pmview directory.

The \desktop directory holds a lot of

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information. Often EAs are there, along with several other objects. If you examine the \desktop directory using the DIR command, often there doesn't seem to be anything in it at all!

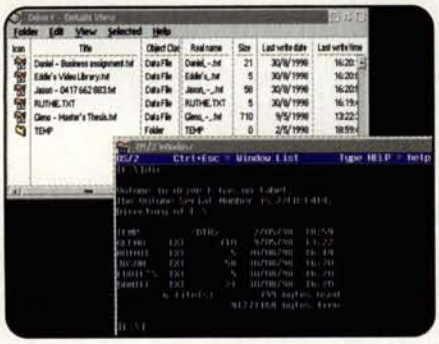
Generally, most users leave \desktop alone, unless using the PM interface (drag and drop), but try this experiment: write some text into a file using the OS/2 System Editor, and save it into X:\desktop. Sure enough, moments later that file will appear on your desktop. Personally, I don't use the \desktop directory for many files myself, but I do have a few shadows there . . .

Oops! Lucky I've got a \delete directory!

Snooping OS/2 users may have seen a line like the following in their CONFIG.SYS file in their root directory:

```
SETDELDIR=C:\DELETE,512;D:\DELETE,5
12;E:\DELETE,512;F:\DELETE,512;G:\DEL
ETE,512;
```

This command exists if you've turned on the OS/2 undelete feature, which is rather like the Windows 95 Recycle Bin. Depending on what the line in your CONFIG.SYS says, a \DELETE directory is created in the root of the hard drive, and recently deleted files are held there temporarily in a FIFO (first-in, first-out) fashion. As more erased files fill the \delete directory, the older ones are purged to make more room.



The files in the \delete directory are usually hidden, and are usually renamed to an OS/2-generated filename. Manually undeleting files is pretty difficult; just use the OS/2 command UNDELETE. If you want to disable the OS/2 UNDELETE command, simply add a REM in front of the SET DELDIR line in your X:\CONFIG.SYS file.

The road to \nowhere

Although hidden — most OS/2 users don't even know about it — the \nowhere directory is quite important. It holds transient objects — not actually files as such, but objects. One example is the Task List, which generally hangs out in memory but, as all objects must, associates itself with the hard disk somewhere.■

The directories on your OS/2 boot drive

\ User start-up files including OS2BOOT, OS2KRNL, STARTUP.CMD, CONFIG.SYS, EA DATA. SF, AUTOEXEC.BAT and the VDM file.

\os2 The base device drivers required to boot OS/2 are here, as are most of OS/2's program and data files. Also, like DOS, the \os2 directory contains command-line executable files like COPY and XCOPY.

\desktop The WPS desktop structure is here; basically the things you see on your desktop, including shadows.

\maintenance desktop A mini-desktop used during OS/2 installation.

\nowhere Transient objects, such as the OS/2 Task List, are kept here.

\mmos2 The OS/2 multimedia bits and pieces are kept here, including drivers, applications and data files.

\delete If enabled, files that have been deleted are held here before being purged from the hard drive, just in case you didn't really mean to obliterate them.

\spool A subdirectory for each printer task list is created here to store data to be sent to the printer.

\os2\system Dual Boot files (like AUTOEXEC.DOS and CONFIG.DOS) and system management files are kept here.

\os2\mdos The DOS emulation files are kept here — there are often several subdirectories relating to DOS programs (including Win-OS/2 files).

\os2\mdos\winos2 The Win-OS/2 emulation files and associated items are kept here. This directory changes depending on what Win-OS/2 programs and support you have installed.

\os2\dll Most of OS/2's Dynamic Link Libraries (DLLs) are stored here.

\os2\boot Files required for the startup of OS/2.

\os2\drivers Device drivers (including IDE and SCSI hard drives) reside here.

\os2\archives If enabled, archives of your WPS desktop are kept here. Most people only enable the archive function after a major WPS desktop change — archiving at every boot takes a *lot* of time.

\os2\apps Applications and games that came bundled with OS/2 are held here. I wouldn't start putting my own applications in here though . . .

\os2\bitmap Desktop backgrounds and other OS/2 bitmaps are kept here.

\os2\book Help files (in *.INF format) are located here, from troubleshooting to trademarks.

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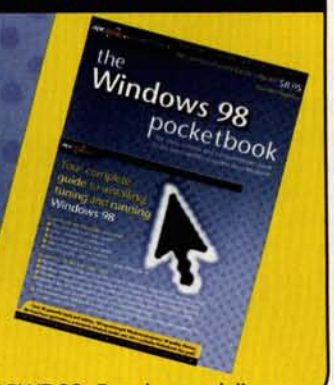

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Contextual menu modules keep popping up.

By Stephen Withers

Mac OS

The continuing development of contextual menu modules (CMMs) suggests this feature is no flash in the pan. Despite previously championing the single-button mouse, I now think it's time for the broad adoption of the two-button variety to avoid the need for Ctrl-clicking, or click-and-hold as provided by Look Mom, No Hands and FinderPop. With the arrival of system-level live scrolling in Mac OS 8.5, I'd even risk being branded a heretic by advocating IntelliPoint-style wheel mice. Maybe the move towards USB support will move things along in the right direction. In the meantime, I strongly advocate the use of click-and-hold software alternatives, though it is irritating when you need to run an incompatible program; for example, this feature of FinderPop doesn't work within Microsoft Word.

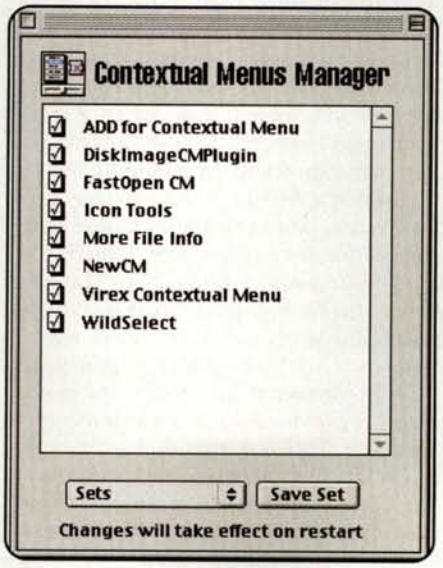
While I'm a contextual menu fan, I do believe in keeping a sense of proportion — just because you can implement a function in this way, it doesn't mean you should. On the other hand, I accept that we work in different ways. Just because I think everyone should know the keyboard commands for New, Open, Close, Save, Print, Quit, Undo, Cut, Copy, Paste and Select All, it doesn't really matter to me if you use the menu commands or toolbar equivalents. You might make extensive use of the Control Strip, while I use OneClick to alter system settings with the press of a function key. So if I rave about a CMM or give it the thumbs down, think how they might fit into your working style, but since they are all freeware or shareware it will only cost you a little time to see if they suit you.

Rather than give individual URLs for each item, I'll simply point out that http://www.control-click.com links to just about every non-commercial CMM I've heard of.

Keep it lean

One of the biggest problems with CMMs is that the menu quickly becomes disorganised as you add modules. What I'd really like to see is some kind of 'master' CMM that could let me arrange contextual menu items in the order I want them, group functionally related items into submenus, and disable individual menu items. So there's no confusion, that last point is to deal with the situation where two CMMs each provide one or more unique functions, but they also have something in common — for example, I really only need one Empty Trash command in the contextual menu.

That's a big ask, but for now remember that just as it can be advantageous to use different collections of extensions and control panels when working on different tasks, you don't always need all your CMMs to be active. As with extensions, unnecessary CMMs can adversely affect performance and this can be especially noticeable in the time it takes the contextual menu to appear. Some start-up managers can handle CMMs (Conflict Catcher, for example, will manage the contents of any folders you care to nominate), but if yours doesn't, try Contextual Menus Manager (shareware, $US10). This small application lets you switch CMMs on or off, and create sets of active modules.



Some CMMs work in the context of the Finder, either to reduce the clutter of drag-and-drop applications or to enhance its functionality.

To kick off the former category we have BinHexTool (freeware), which encodes and decodes files to and from the BinHex format. If you need this function, it's convenient and works smoothly, but encoding and decoding is handled automatically by most email programs and downloaded files typically require unStuffing as well as decoding (StuffIt Expander processes files repeatedly until they are back in their original form). One shortcoming is that BinHexTool can't process a file on a locked volume — a useful enhancement would be the opportunity to navigate to a destination in this circumstance.

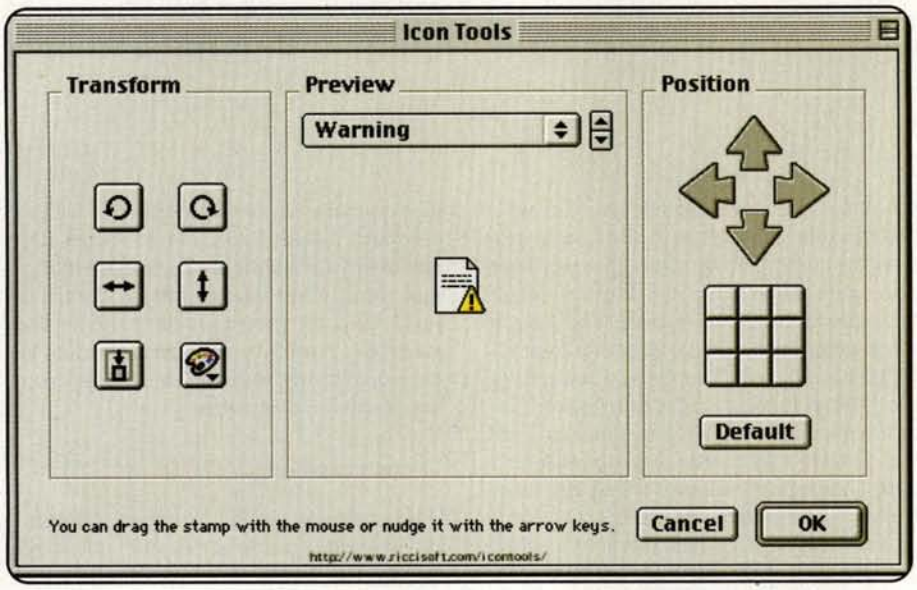
Open wider

Hippo (shareware, $US15) solves the problem of opening a file with a different application. The classic example is when you double-click on a text file only to be told it is too large to be opened by SimpleText; a more recent situation is where a developer provides documentation as HTML files created for the browser you chose not to use. Hippo (don't worry about the name) adds an Open With submenu, with an option for adding applications to this submenu. This is a real convenience once you've put the right applications on the list, but unfortunately Hippo isn't very contextual in the sense that it shows all your chosen applications regardless of their relevance to the type of file you are opening. It doesn't really matter, I suppose, but it does increase the opportunities for accidental selection.

FastOpen (shareware, $US10) takes an extra step and lets you associate one or more applications with particular file types. These links can be through either the Mac OS type code or DOS-style file naming conventions, the latter being especially useful for downloaded files whose type and creator haven't been appropriately set. Associate the extensions SIT, HQX and so on with StuffIt Expander and you've saved a lot of dragging and dropping. Talking of dragging and dropping, the associations are made by dragging documents and applications into a window belonging to a supporting utility, FastOpen Settings. This is easy to understand, but can be awkward in practice, especially when the applications are in nested folders and the screen is small. Unlike Hippo, FastOpen puts the relevant application names directly into the contextual menu, not in a subfolder.

Finder friend

Turning to Finder-enhancing CMMs, the field is led (alphabetically, at least) by A



Better Finder Rename and A Better Finder Select (shareware, $US10 each). Despite sounding like questionable Yellow Pages entries, these add-ons go some way towards making up one of the disadvantages of a GUI compared with a CLI (command line interface). The use of wildcards to specify a set of filenames can be a great convenience, for example to move all the HTML and GIF files but no others from one folder to another.

A Better Finder Select (ABFS) might be better called a Better Finder Deselect, as it finds a subset of the current selection according to rules such as the filename *starting* or ending with or containing a substring, or matching a wildcard specification. The selection can be successively refined, and the rules can be negated (for example, 'not containing'). I'd rather the default behaviour was to select from all the files in the frontmost Finder window, but it's no big deal to type Command-A before popping up the contextual menu. I'd also like to be able to select all the files in the folder with the same type and/or creator as the currently selected item. Once you've got the selection you want, you can drag the files into a folder, onto a drag-and-drop application, or whatever.

A Better Finder Rename (ABFR) lets you add, remove or replace a substring at the beginning, end or anywhere in a name; change capitalisation; or reformat numbers (for example, to add leading zeros, so your 'Picture x' screen dump files sort in natural order). This is a relatively specialised function, but ABFR is a real boon if you do need it and can be used in conjunction with ABFS.

In a similar vein to ABFS comes WildSelect (freeware) which allows the selection of files using single or multiple-character wildcards and specific characters. For example, the string 'a*' matches any filename starting with 'a'; 'Fred ?' matches those comprising 'Fred.' plus one more character; and '[0-9]*' matches all files starting with a digit. Like ABFS, WildSelect leaves a subset of the current selection but it does provide more flexible selection criteria. It doesn't work particularly quickly, but it is faster than doing the job manually.

Although the Finder lets you copy and paste icons, Mac OS doesn't come with icon-editing tools. The aptly named Icon Tools (shareware, $US15) doesn't let you work at the bitmap level, but it will create thumbnail icons for picture and movie files, overlay the existing icon with 'stamps' (arrows, ticks, smileys and many more are provided), and apply a few special effects. It also simplifies the construction of custom folder and disk icons, and allows icon copying and pasting without using Get Info. If you like diddling with icons, give this utility a whirl.

Apple has added to the range of CMMs with Disk Image CM Plugin, which mounts disk image files created by Disk Copy and other utilities without requiring the application. It doesn't seem any more convenient to me, but if that's all you need to do it saves over half a megabyte of disk space compared with Disk Copy.

Sometimes you think there should be enough space on a volume to save a document, but it won't fit because you didn't get round to emptying the Trash. While it doesn't take long to switch to the Finder, empty the Trash and bring the original application back to the foreground, it would be clearly more convenient if you could do the job from the program you're using. Empty Trash (freeware) adds exactly this capability to the contextual menu.

The Trash can also be emptied from the contextual menu if you install FinderPop (freeware). Although this is a control panel rather than a CMM, it enhances the contextual menu in a variety of ways (including process switching and quick access to desktop items even when they are obscured by open windows) and is one of my favourite utilities.

Reflected glory

As the idea of contextual menus materialised in Windows 95 before Mac OS, it isn't surprising that some CMMs duplicate Windows 95 functions.

NewCM (shareware, $US9) makes it easier to create new documents or folders in particular locations. Normally, you'd open an application or stationery item, then save the new document, navigating to the desired location through the usual dialog box. Various add-ons make it easier to reach the destination, but when the folder is already open on the desktop it's much easier to use the contextual menu. NewCM lets you provide a collection of template files (which work like — but aren't — stationery documents) so you can control what appears in the New submenu. The developer, David Catmull, also included some wrinkles that let you control the order of menu items and insert dividers, and there's even a mechanism for opening a template with a specific application that isn't its creator. I'm not sure whether that last feature is worthwhile, as surely it would be easier to resave the template with the creator you want. Nevertheless, this is a useful item.

Paying their way

Some commercial utilities include a CMM to simplify the use of the program itself or make it more convenient. Examples include Virex (http://www.pica.com.au/Content_Pages/picavirex.html), which allows the scanning of one or more files, folders and/or volumes from the contextual menu; and the recently released MacLinkPlus Deluxe 10 (http://www.conexus.com.au/conexus/Vendors/Dataviz/MLinkplus.html), which uses the contextual menu to display the content of documents directly from the desktop.■

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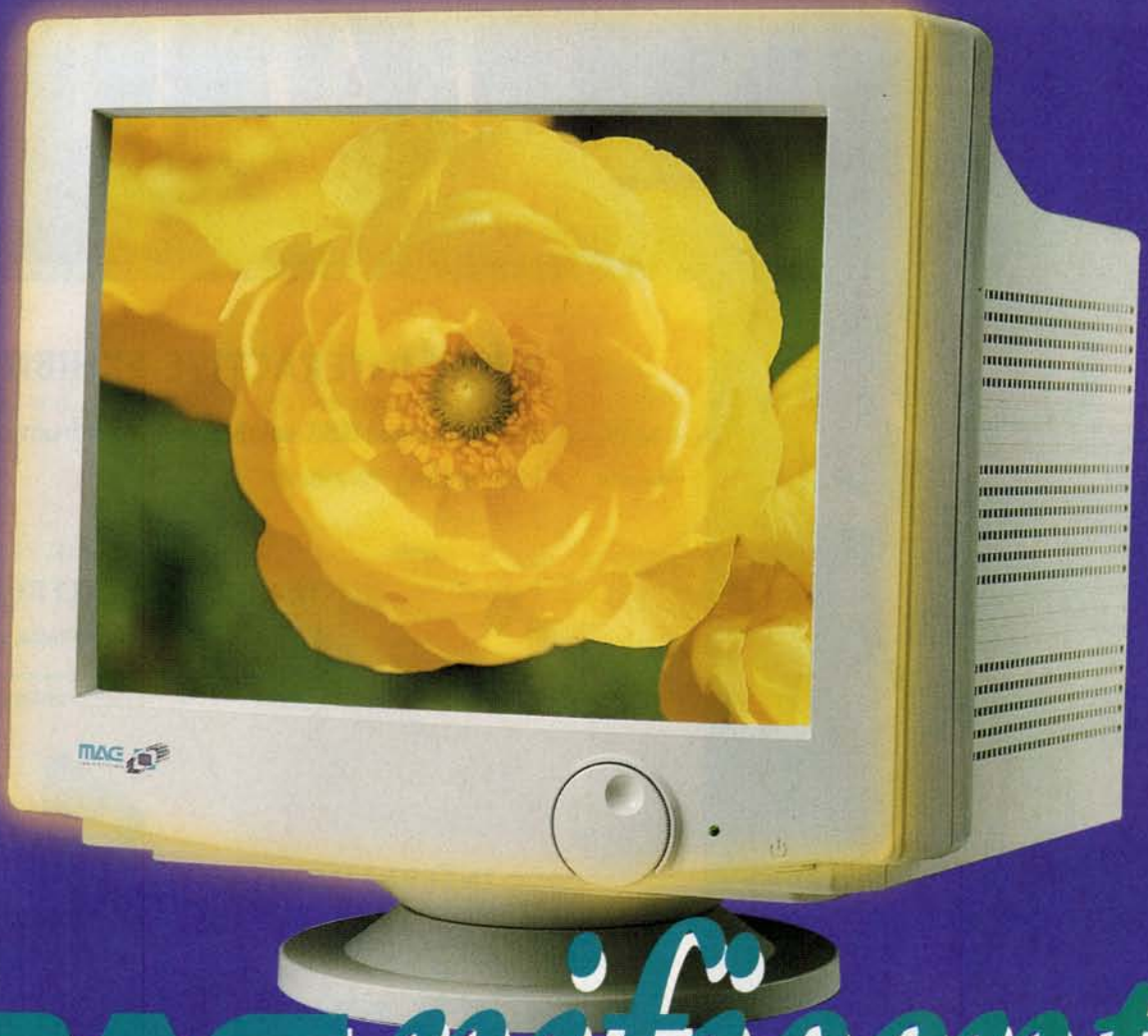

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Setting up an FTP server with Linux and WU-FTPD.

By Geoffrey Bennett

Linux

FTP is the Internet standard File Transfer Protocol and, as you can probably guess, Linux can perform admirably as an FTP server. This article will explain how to set Linux up as an FTP server for three purposes:

- Regular FTP with log-in names and passwords.
- Anonymous FTP for sharing files with the world.
- Guest FTP (explained later, but often used by ISPs wanting to allow customers to modify their own Web pages).

The usual FTP server used with Linux is the Washington University FTP server (wu-ftpd). Red Hat Linux keeps this server in a package of the same name, and Debian GNU/Linux keeps it in the 'wu-ftpd-academ' package. If you want to run an FTP server, installing this package is the first step.

Regular FTP

Regular FTP refers to allowing a local user to log into your computer, browse through the file system, and upload or download files (subject to the usual restrictions based on Linux file permissions).

FTP is started by the inetd 'super-server', which should have been installed if you selected networking services when you installed Linux. For your reference, Red Hat Linux keeps inetd in the netkit-base package, and Debian keeps it in the netbase package.

The services that inetd controls are configured in the /etc/inetd.conf file. A line like this indicates that the /usr/sbin/in.ftpd server (sometimes named /usr/sbin/ftpd) will be started by inetd when an FTP request is made to your computer:

```
ftp stream tcp nowait root /usr/sbin/tcpd in.ftpd -l -a
```

To disable the FTP server, you should place a '#' sign at the beginning of the 'ftp' line, and restart inetd by typing (for Red Hat Linux):

```
/etc/rc.d/init.d/inet restart
```

For Debian GNU/Linux:

```
/etc/init.d/netbase reload
```

Or more generically:

```
killall -HUP inetd
```

To re-enable the FTP server, remove the '#' from the beginning of the line and restart inetd.

Once you have ftpd installed and inetd configured to run it when an FTP request comes to your computer, any user you have added to your system will be able to connect and transfer files using a standard FTP client (under Linux, try either ftp or ncftp -u).

If you want to configure anonymous FTP or guest FTP, configure and test your regular FTP setup first, as if this doesn't work neither will anonymous or guest FTP.

Certain users (such as root) are excluded from logging into your FTP server for security reasons; these are listed in /etc/ftpusers. By adding to this list, you can exclude other users logging in.

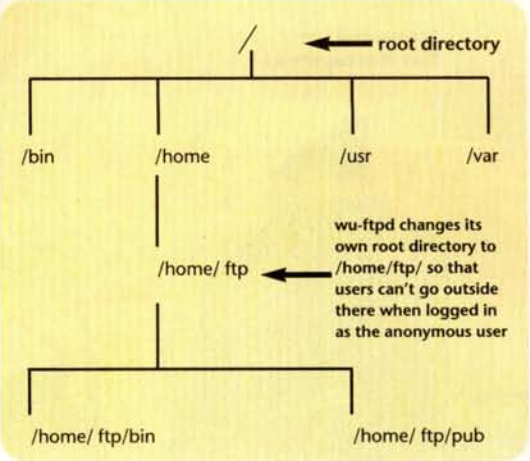
Anonymous FTP

Although regular FTP is fine for transferring files when you know who you want to give access to, it is not appropriate if you want to share files with the world. 'Anonymous' FTP refers to allowing anyone who knows the name of your server to connect to it and log in as the 'anonymous' (or 'ftp') user, without needing to specify any particular password (although it is customary for them to supply their email address).

Setting up anonymous FTP can be a bit tricky, and for this reason, most Linux distributions provide a package that automates its setup (Red Hat Linux includes the anonftp package; Debian GNU/Linux includes an addftpuser script in the wu-ftpd-academ package). Since anonymous FTP allows anyone to log into your system without a password, it is important that the server is set up correctly, otherwise people may be able to gain unauthorised access.

Most of the security of anonymous FTP is enforced through a Linux feature known as chroot (for *change root*). The FTP server changes its own root directory to /home/ftp so that regardless of what happens from that point on, it is impossible for the anonymous user to go outside the bounds of the chroot 'gaol'.

You can now place files in /home/ftp/pub if you want them to be



accessible to anyone. When you connect to your FTP server, you will notice that the files which you placed there appear to be in the /pub directory, and anything outside /home/ftp will not be accessible at all.

It would be best to not modify the permissions or ownerships of any file not in the /pub directory, as incorrect permissions could allow the security of your server to be compromised.

By default, you need to be root to modify any of the files in the /pub directory, but you can change permissions/ownership as you wish so that you (or others) can maintain the area without needing to be logged in as root.

As you may know, Linux internally only uses numeric user ids (UIDs) for recording file ownerships and so on. When you run a command such as ls -la to display a directory listing, it looks up the UIDs in the /etc/passwd file so it can show you the user name of the file's owner. If the /etc/passwd file doesn't contain the relevant user name, ls will just display the UID.

Because anonymous FTP runs in a 'chrooted' environment, an /etc/passwd

file must be located in the /home/ftp directory otherwise a directory listing will only display the UIDs. The default /home/ ftp/etc/passwd will include at least an entry for root; you can add other entries if you want the real user name displayed. For example, here is a directory listing with UIDs displayed:

To put a user name in the place of the UID, copy the information from the relevant line of your real /etc/passwd into /home/ftp/etc/passwd, but you *must* remove the encrypted password and any other information you don't want to become public. For example, here is the original line from /etc/passwd relating to UID 500:

```
total 7
dr-xr-sr-x   6 root   ftp 1024        Sep 18 11:19 .
drwxr-xr-x   6 root   root1024        May  8 17:55 ..
drwxrwxr-x   2 500    500    2048 Aug 31 11:01gnome-0.20
drwxrwxr-x   2 500    500    1024 Aug 19 08:39 gnome-0.27
drwxrwsr-x   3 root   ftp    1024 Jul 12 16:42 redhat
```

```
# grep 500 /etc/passwd
geoffrey:Dt16hRAzCXfeU:500:500:Geoffrey D. Bennett:/home/geoffrey:/bin/zsh
```

And this is what you would place in /home/ftp/etc/passwd (note how the encrypted password and all other information not relating to the username or UID has been removed):

```
geoffrey:*:500:500:::
```

For the group ID (GID), you'll need to follow a similar process with /etc/group and /home/ftp/etc/group.

Message files

One commonly used ftpd feature is 'message' files that are displayed (for example) when a user logs in. This is configured with a line such as:

```
message /welcome.msg login
```

in your ftpaccess file. Remember that for anonymous users, all paths are relative to /home/ftp.

Guest FTP

Sometimes there is a need to allow your users to log into your server, but prevent them from having shell access, or any other access outside their home directory. This can be done with a feature of wu-ftpd called 'guest' logins (as opposed to regular or anonymous logins).

Guest logins are authenticated as for regular logins, but are restricted (with chroot) like anonymous logins, so the user can't move beyond their home directory.

The first step to setting up guest FTP logins is to define a group that the guest users will be placed in. For example, you could type: groupadd ftpusers. The next step is to tell wu-ftpd about the group you have created. In the ftpaccess file (most likely located in /etc or /etc/wu-ftpd- academ), add a line: guestgroup ftpusers. You should also check that ftpd is being invoked with the '-a' switch so that use of the ftpaccess is enabled (see 'Regular FTP', above).

The ftpaccess file also controls what permissions different classes of users have, and there may be lines restricting what guest and anonymous users may do. For example:

```
delete    no    guest,anonymous
```

says that neither guest users nor anonymous users may delete files. To allow guest users to delete files, remove the word 'guest':

```
delete    no    anonymous
```

Repeat the change for any other permissions defined (such as chmod, overwrite, or rename).

After configuring the guest group, you need to set up the individual user accounts as for anonymous FTP (a chrooted environment must be self-contained, otherwise some important functions — such as directory listings — will not work). The easiest way to do this is to copy the files in the bin, etc, and lib directories from /home/ftp to the home directory of your guest FTP user. To save on disk space, hard links can be used instead of simply copying the files.

To stop users logging in with telnet, you can set their shell to a program such as /bin/false which doesn't do anything; if the user tries to log in, they will immediately be logged out.

When logging into an FTP server, it checks that the user's shell is listed in /etc/shells, so you'll need to add /bin/false (or whatever the user's shell is) to that file.

The command you'd use to add a user would be similar to:

```
useradd -g ftpusers -s /bin/false testftp
```

where:

- -g ftpusers puts them in the ftpusers group
- -s /bin/false sets their shell
- testftp is the username to create

After creating the user, you need to change the ownership of their home directory to root, because if they can write to their home directory you may as well give them shell access (for example, if they can create a '.forward' file, they will be able to run programs outside their chrooted area).

Since they can't write to their home directory, you'll need to create a directory where users can store their files; the traditional directory name for Web pages is public_html.

There is a script called ftpadduser on this month's **apcmag.cd** which adds a user, links to the files from /home/ftp, and then sets the ownership/permissions correctly.

User directories with Apache

Now that users can modify files in their home directory through FTP, their Web pages placed in /home/user/public_html should be accessible using a URL of the form: http://www.yourcompany.com.au/~user/.

If you prefer to use a different directory than public_html, you can configure it with the UserDir directive in either the srm.conf or httpd.conf Apache configuration files. These files can usually be found in /etc/httpd/conf or /etc/apache.

Further information

More information on wu-ftpd and the options available can be found in the following manual pages and Web sites:

- ftpd(8): Information about the FTP server itself
- ftpaccess(5): The main configuration file
- ftphosts(5): The host access control file
- http://www.academ.com/academ/wu-ftpd/: The official wu-ftpd Web page
- http://www.cetis.hvu.nl/~koos/wu-ftpd-faq.html: Frequently Asked Questions for wu-ftpd.■

Programming a demo version.

By Michael Smith

Developers Corner

Way back in the dim, dark past — before we even had Windows — a revolutionary idea shook the foundations of software marketing. Instead of trying to sell the software, you give it away, and request that the user pays for it afterwards. The idea was called *shareware*. This was very attractive to buyers as they could try out the software before they parted with their hard-earned dollars. It was popular with sellers as they saw their software quickly distributed to many users without spending a bundle on advertising. Some, like McAfee Associates and PKWare, made a fortune. Others were less successful.

The basic premise of shareware distribution is that computer users are basically honest; they will pay for their software even if they can get away without doing so. It's a lovely premise. It warms the heart. Pity it's not true. For each person who happily hands over their registration fee, there are several others who don't. Shareware authors soon became disgruntled, and thus was born the *demo version*.

A demo version of a program is one with restricted features or, more often, an expiry date. We are going to concentrate on the latter of those: a program that functions normally for a particular time then refuses to execute with an appropriate warning message. You get to try out the software, making sure it works the way you need. Then just as it becomes an indispensable part of your working day, it expires and will no longer operate. This will create two urges:

- To take the author and make them feel pain of a magnitude that they could never have previously imagined.
- To pay the author money so the software will work again.
- While the first option seems, initially, a rather good idea, we usually cave in to social pressure (and fears of an extended gaol sentence) and settle for the second.

More and more shareware authors began releasing demo versions; users continued to choose paying over dismemberment (mostly) and they all lived happily ever after.

So how do we make a demo version?

The algorithm is simple. You store or calculate an expiry date, then test if today's date is later than the expiry date. If it is, the program should terminate with some appropriate message about sending the author lots of money. However, as always, the devil is in the detail.

There are two issues that need to be dealt with:

- Where and how do you store the expiry date?
- How do you stop a mischievous user from tampering with it?
- There are three strategies for storing an expiry date: inside the executable; in a system area such as an INI file or registry; or in an external data file.

Internal options

Storing the date in the executable is, in many ways, the simplest. You can hard-code an expiry date into the program, and terminate execution if the date has passed.

```
if (time(NULL) > decode_datestring( "1-11-98" >{
  print_demo_message();
  exit( 1 );
}
```

While this is very easy to implement, it has one large drawback. You must recompile the program every time you change the expiry date. This strategy works well for something like the Netscape beta program, where the program is set to expire when the next beta version is due out. It is less suitable, however, for a 30-day demo of a program which you just want to put it on a Web site and leave it there. Even worse if the Web site has mirrors.

An interesting variation is what I call the Zap-Date strategy. You store the date in a structure along with some easily identifiable tag, for example:

```
typedef struct timedata_t{
  char tag[30];
  char date[11]; /* e.g. 01/01/1998 */
} timedata_t;

timedata_t expiry ={
  "Some easy to find string. ACB";
  "01/01/1900";
};
```

A second program, the Zap program, searches through the executable for the tag. When it locates the tag, the Zap program writes a new date into the executable file, thus changing the expiry date without recompiling. The Zap program can be run manually, by an installation program, or even by a CGI script just before the main program is downloaded. This strategy was popular a few years ago but has fallen out of favour more recently due to a nasty side effect. Modern compilers put a checksum into an executable. This is used by some virus detection programs to determine if an executable has been altered by a virus. If you Zap a new date into an executable, without updating the checksum, virus detection programs report that the EXE has a virus. This is not a big hit with users.

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In the system area

Saving an expiry date in the Windows registry offers many advantages. It can be done easily by an installation program. It avoids the need to modify the executable and the difficulties of managing external files. The main limitation of this strategy is that it is probably the easiest to hack past. It is surprising how often demo software will write an unencrypted date into an INI file or the system registry. A user can then change the date to something further in the future, like sometime in 2035, and continue using the software. Even if the date is encrypted, if the user can locate the entry then they can delete it, reinstall the software and get another 30 days' use.

A solution for that is to *hide* the entry in some inappropriate corner of the registry with no obvious linkage to your software. This has two problems. Firstly, it is considered quite bad programming practice to write to strange parts of the registry. While you'll probably get away with it, the software is doing something which is considered bad behaviour and it may one day run afoul of other software. Secondly, it is still far from foolproof. Commonly available debugging tools can keep a log of registry access. Once the entry is located in the log, deleting it is relatively easy.

External files

Saving an expiry date in an external file provides many of the same strengths and weaknesses of the other two methods, but with a few extra twists. A complex binary file, particularly an encrypted one, is relatively hard to crack, though easy enough to delete. This makes an external file that is shipped with the software, or one generated with a special password quite effective. However, an external file generated automatically by an installation program is relatively insecure.

Stopping the nonsense

How do you stop users bypassing your demo limitations? At the bottom line, you don't. No matter how much effort you apply to protecting the software, somebody with plenty of time and the right tools will probably be able to crack the software. The aim is to make sure that it isn't too easy to crack the software, so that the average user probably couldn't be bothered.

There are two main strategies to consider. The most common way to bypass a time-out restriction is to change your system date. Set the date to a few days before the software expired, use the software, then set it back. It's easy to do, but it's also easy to catch. Simply check the system date against a few files which are updated regularly. If the system date is earlier than any of those file dates, it's likely that someone is trying to be sneaky.

```
#include<windows.h>
#include<stdio.h>
#include<time.h>
#include<sys/stat.h>

int ValidateFileDate( char *szFname )
{
  struct stat st;
  if(stat( szFname, &st)==0)
    if (time(NULL)<st.st_mtime) return 0;
  return 1;
}

int ValidateSystemDate( void )
{
  char szFname1[MAX_PATH];
  char szFname2[MAX_PATH];
  char szFname3[MAX_PATH];

  GetWindowsDirectory( szFname1,
MAX_PATH );
  strcat( szFname1, "\\SYSTEM.DAT" );
  GetWindowsDirectory( szFname2,
MAX_PATH );
  strcat( szFname1, "\\USER.DAT" );
  GetWindowsDirectory( szFname3,
MAX_PATH );
  strcat( szFname1, "\\WIN.INI" );

  return ValidateFileDate( szFname1 )
       && ValidateFileDate( szFname2 )
       && ValidateFileDate( szFname3 );
}
```

The second way users might get past your time-out is to tamper with the expiry date. Encrypting the date can stop users altering it, but won't prevent the user deleting a data file or registry entry and reinstalling the software.

For really heavy-duty applications, I'd recommend using an external data file. Have the installation program prompt the user to phone or email for a password which has the expiry date encoded in it and use that password to build the file.

For common applications this would be complete overkill, and users probably wouldn't like having to phone up for an installation password. I'd probably recommend an encrypted date saved in the registry. When the user registers the program you can send them a password, and the software can use that password to create an unlimited expiry entry in the registry. If someone is keen enough to reinstall the software every 30 days they will probably never pay for it anyway.■

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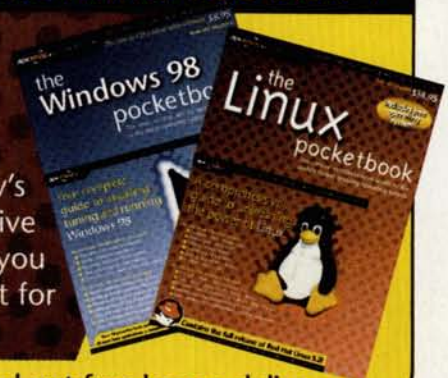

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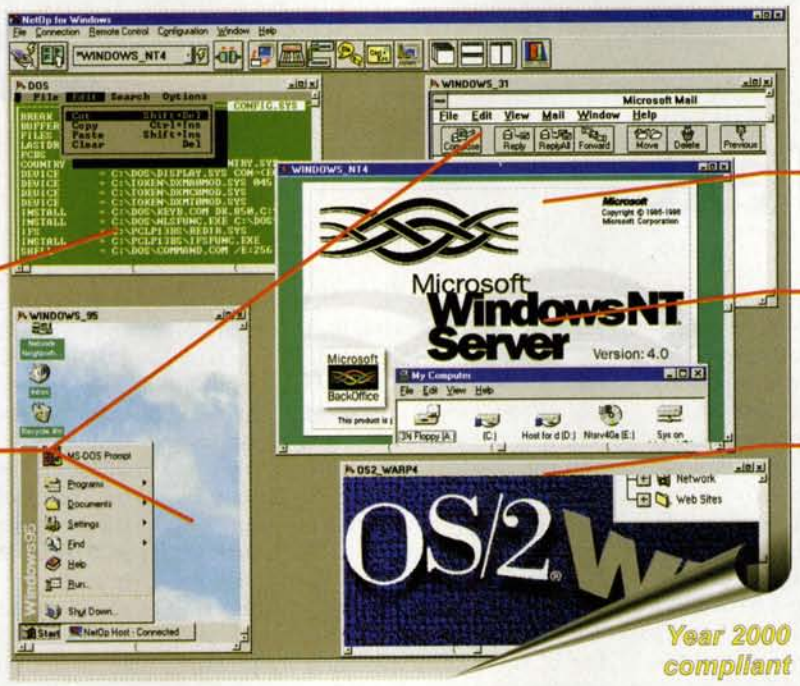

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Remote Control Windows NT 3.51 and 4.0 with very fast screen transfer.

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Non-standard features can be useful in a standardised environment. **By Lee Borkman**

HyperText

The whole ethos of the Internet has always been one of cross-platform egalitarianism. Now, sadly, the Net, and especially its glamorous Web front end, have become serious business. What was once a community has become a marketplace, and competition has replaced cooperation. Nowhere is this more obvious than in the infamous browser wars. For years, it seems, I have been ranting about browser-specific HTML — how it should be avoided by all serious Web developers — but it's time to be a little more pragmatic, a little more commercially focused.

I'm currently working in an organisation where I deal with a public Web site of around 500 documents. We have standards that demand the maximum cross-platform, cross-browser compatibility. We have to cater for all manner of disadvantaged users, be they low-speed, sight impaired, or America OnLine.

That's on the public site. There's another small site that is not publicly accessible — an intranet. It currently comprises around 10,000 documents. When I design and develop for this intranet, I know which browsers, which platforms, and which plug-ins my audience will be using. In fact, I was one of those who decided exactly what configuration would be rolled out to all 7,000 staff. That's the environment in which 90% of my authoring occurs. It's a controlled, standardised environment.

This kind of setup does have its problems. Until very recently, we could not use any Java, because our corporate browser was 16-bit Netscape Navigator. On the other hand, it does mean that we can build sites quickly, without the burden of testing on multiple platforms, without the need to make compromises for the sake of browser compatibility. Sometimes we even get the chance to optimise! Actually, there's a touch of culture shock when we come to build for the public Web. The Macintosh, the 486DX2, the Solaris workstation — they're all booted up for testing, and our sleek code is soon unrecognisable.

So what's my point? Well, clearly there are circumstances in which all the rules of platform independence can be forgotten. The corporate intranet is the classic example. Intranets are there to help your business do business. Any piece of technological trickery will do; your job is to make that internal Web as fast and as intuitive as it can possibly be.

If all of your audience is going to be using the same browser and operating system, you can push the HTML envelope. Both major browser manufacturers have defied all attempts to standardise the Web's mark-up language. Let's look at a few of the more interesting proprietary extensions.

Internet Explorer developers can make use of some handy features. The best known of these is probably the <MARQUEE> tag. This tag allows parts of your contents to scroll across the page:

```
<HTML>
<HEAD><TITLE>Marquee
Example</TITLE></HEAD>
<BODY>
<MARQUEE>Believe it or not, this text is
moving
</MARQUEE>
</BODY>
</HTML>
```

The content enclosed within the MARQUEE tags will scroll across the browser. Almost any HTML code can be used, including hyperlinks and images. The <MARQUEE> takes several attributes, which provide as much flexibility as those ubiquitous Java ticker applets; WIDTH and HEIGHT, HSPACE and VSPACE, ALIGN and BGCOLOR behave much as you would expect, but there are also attributes that control the way your marquee scrolls.

DIRECTION: This is either Left or Right. The default is Left.

BEHAVIOR: This can be set to Scroll, Slide or Alternate. 'Scroll' is the default value, meaning that the entire content appears at one side of the marquee and scrolls until it disappears off the other side. 'Slide' specifies that the content should gradually appear at one side and slide across until it stops at the other side. 'Alternate' makes the content bounce back and forth.

LOOP: How many times will your marquee scroll? This can be set to any positive integer value, or to 'Infinite', which is the default.

SCROLLAMOUNT: This attribute, given in pixels, defines the size of each step that the content makes across the screen.

SCROLLDELAY: This defines the time interval, in milliseconds, between successive steps. Use the SCROLLAMOUNT and SCROLLDELAY attributes to specify the speed and smoothness of the scrolling. Be warned, however, that small steps and small delay times will give extra-smooth scrolling, but they will also make your client browsers do an enormous amount of work.

The MARQUEE tag can take several other attributes, but those mentioned here will be enough for most situations. Be very careful when using marquees. As with all moving content, marquees can be very distracting or even annoying when overdone. A couple of years ago, the BLINK tag was public enemy number one, then it was the animated GIF. Take heed, and use good sense at all times.

Another useful tag for Internet Explorer is <IFRAME>, the inline or 'floating' frame. IFRAME creates a separate, scrollable, targetable frame right in the middle of your page's content. No need for messy FRAMESET files.

```
<HTML>
<HEAD><TITLE>Untitled</TITLE></HEAD>
<BODY>
This frame is in the 
<IFRAME SRC='http://apcmag.com'
NAME='float' ALIGN='MIDDLE'
WIDTH='200'
HEIGHT='200'>
Warning! This page can only be viewed with
Internet Explorer!
</IFRAME>
 middle of my page.
</BODY>
</HTML>
```

Like the MARQUEE tag, IFRAME takes

basic WIDTH, HEIGHT, HSPACE, VSPACE and ALIGN attributes. Apart from that, the IFRAME tag looks pretty much like the FRAME tag, and takes the following standard attributes.

NAME: This attribute defines the name which can be used in <A HREF?> links to target the floating frame.
SRC: This specifies the URL of the content that will be displayed inside the frame. In most cases, this will be an HTML file, but it could also be a CGI script or an image.
SCROLLING: Yes, No or Auto. The default is Auto, meaning that scrollbars will only appear if the frame content cannot fit into the frame.
FRAMEBORDER: Yes or No. The default is Yes. If frameborders are switched on, then the BORDER and BORDERCOLOR attributes will be enabled.
BORDER: This is a positive integer value that sets the thickness of the border displayed around your frame.
BORDERCOLOR: A standard colour name, or a hexadecimal RGB value, which defines the colour of the frame's border.

If a browser does not support floating frames, then the content between <IFRAME> and </IFRAME> will be displayed instead.

If your audience is using Netscape Communicator, then you also have a few special tricks at your disposal.

Have you ever twisted your mind by trying to control whitespace and indents on your page? Ever been lost in a sea of nested borderless tables, and non-breaking spaces? You need the <SPACER> tag. This Netscape-only tag is used to display a block of white space anywhere you want it. The tag takes the following attributes.

ALIGN: This defines the alignment of the text that flows around the spacer, and operates exactly like the <IMG> tag's ALIGN attribute.

TYPE: This can be Horizontal, Vertical or Block. In most cases, it's simplest to use the Block type, which gives you the ability to set vertical and horizontal space in the one tag.
SIZE: If you do choose a Horizontal or Vertical spacer, then the SIZE attribute simply defines how many pixels of space will be displayed.
WIDTH and HEIGHT: For Block spacers, you define both dimensions of the block. Values are given in pixels.

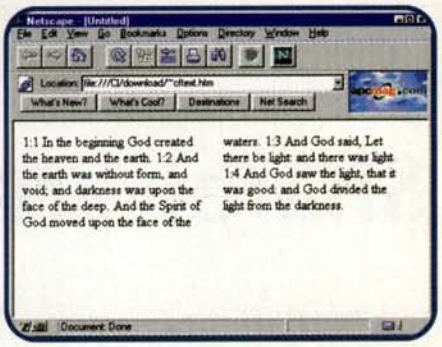
One of the most vexing problems in designing Web pages is displaying text in columns. You can almost do it with tables, but you have to know beforehand just where to break your content. Netscape's <MULTICOL> tag does all the hard work for you, and it's one of the simplest, most useful tags you could imagine.

```
<HTML>
<HEAD><TITLE>Untitled</TITLE></HEAD>
<BODY>
<MULTICOL COLS='2' GUTTER='20'>1:1 In the beginning God created the heaven and the earth. 1:2 And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. 1:3 And God said, Let there be light: and there was light. 1:4 And God saw the light, that it was good: and God divided the light from the darkness. </MULTICOL>
</BODY>
</HTML>
```

MULTICOL takes only three attributes:

COLS: This specifies the number of columns that will be displayed.
WIDTH: This attribute can be given in pixels, or as a percentage of the available screen space. It defines the width of the entire multicolumn layout.
GUTTER: This value (in pixels) defines the amount of space between columns.

Of course, there are many other browser-specific or platform-specific elements that you could use in a restricted intranet. You can choose to opt for extensive JavaScript, or go for Microsoft's VBScript instead. You can make explicit use of the Windows operating system by using ActiveX controls, or you can stick to Java applets that will be less efficient but much more ideologically sound. You can rely on proprietary plug-ins, without worrying about inconveniencing or alienating great swathes of your target audience. Wouldn't it be nice if you could just take it for granted that your users have an



Acrobat reader and a Flash player installed? Just think of the things you could do.

At this point, you're probably wondering why I haven't mentioned style sheets. We all know that the major Version 4 browsers interpret Cascading Style Sheets very differently. Yet surely we could make good use of styles in a single-platform intranet? Well, sadly, it seems that we are not yet at the stage where style sheets are capable of delivering the benefit for which they are designed.

In other words, style-sheets can't yet give us the ability to separate our content from our formatting. Of course, it's not the fault of the CSS standard, but rather of the current browser implementations, which are extremely patchy. At the moment, the only reason to use style sheets is to allow formatting that just can't be done any other way (for example, leading — adjusting the space between lines of text). But that was never the point, was it? We still have a while to wait before style sheets come into their own.

These are just a few thoughts on how you might push the normal boundaries in a tightly controlled intranet. There are, of course, many other things you can do with a private network if you really want to increase productivity. Web technology might be the flavour of the week, but don't forget the more traditional Internet services.

Email is an obvious choice, but how many corporate intranets have their own internal newsgroups? Even the archaic list server has its uses in a corporate environment. There are also newer ideas, like push technology, and sophisticated groupware-cum-workflow systems. Any or all of these can be integrated into a private network with incredible benefits.

The most amazing thing about the intranet is that it took so long for anyone to think of it. Don't be afraid to try new things — you may put a few conservative noses out of joint, but the workplace will love you for it.■

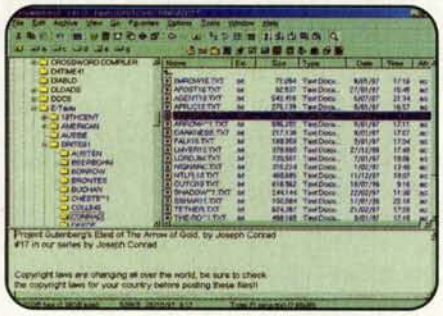
*Each month this page lists all the Shareware files to be found on **apcmag.cd**. Simply browse to the Workshop section to find the files and related reviews.*

Shareware summary

Windows 95

PowerDesk Utilities 98 3.03

Excellent Windows Explorer replacement with many new features and enhancements. Bundled with five other useful tools, including one for generating customised multifunction toolbars.



FreeSpace 1.03

Effective disk compression program which operates at file level. Will work on FAT32 drives, and can achieve large storage space savings.

RealKeys 1.1

Allows function keys to be assigned to launch programs (or files with associated applications).

File Investigator 1.41

Handy tool which examines a file's contents to determine its format and provide much useful information. Recognises over 300 file types.

PaneKiller 1.25

Flexible system navigation tool which provides a hierarchical menu of all available files. Activated from the system tray and highly customisable.

OS/2

EZirc 1.20

EZirc is a very useful Presentation Manager IRC client for OS/2. Easy, intuitive and best of all free. Just enter your log-in name, full name and a nickname (the name others IRCing will see). Once you're connected to the server, simply click a button to join a channel.

GammaTech Internet Relay Chat 1.04

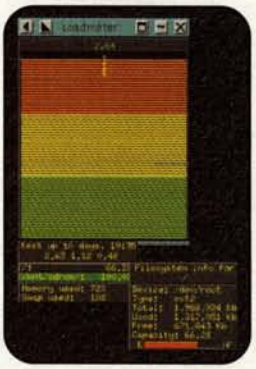
An easy-to-use PM IRC application from the creators of GammaTech Utilities. The client window is divided into five parts: title bar, menu bar, the output window, the toolbar and the input window.

IRC/2 0.8

A text-based FTP client (just like the good old days). Don't be fooled by its ugly interface, IRC/2 has all of the power you need, without being tied down to a GUI — it's just a little more difficult to use, that's all.

OpenChat/2 1.05

OpenChat/2 provides full support for the ircII scripting language and one-click feeding of URLs to Netscape or Web Explorer. Script hooks give access to pull-down menus and drag-and-drop support — even raw access to MMPM/2.



Mac OS

Smoothie 1.12

Smoothie can take the jagged edges away from any vector-based image using sophisticated anti-aliasing techniques.

ImageViewer 4.61

ImageViewer is a multiformat image viewer with a bundle of extra features that quickly become impossible to live without. ImageViewer can compile lists of images from folders, modify the lists, and even output them as HTML pages.

DeBabelizer Lite LE

DeBabelizer Lite LE is a graphic file format converter which specialises in converting between professional TIFF formats and Mac/PC aspect ratios while maintaining a high degree of colour integrity.

MakeRefMovie

MakeRefMovie is a utility designed to allow Web authors to embed different versions of QuickTime media in a file.

XEarth 1.02

XEarth is the Macintosh version of the popular XEarth for Unix application.

Linux

ltrace

An extremely useful system call and library tracing utility for Linux which may be used to track down problems within applications and their interaction with the system.

TkInfo

This GUI-based viewer for info documentation features a slick interface. TkInfo should make it easier for many users to navigate this type of documentation.

Nevermind Who

GUI version of the Unix rwho facility, built with the GTK interface libraries. Also allows for viewing thumbnail images of users.

Hexedit

A nicely implemented screen-based hex editor for working with binary files.

Loadmeter

Simple X application which displays the system load and provides easy to access information about memory and disk utilisation.■

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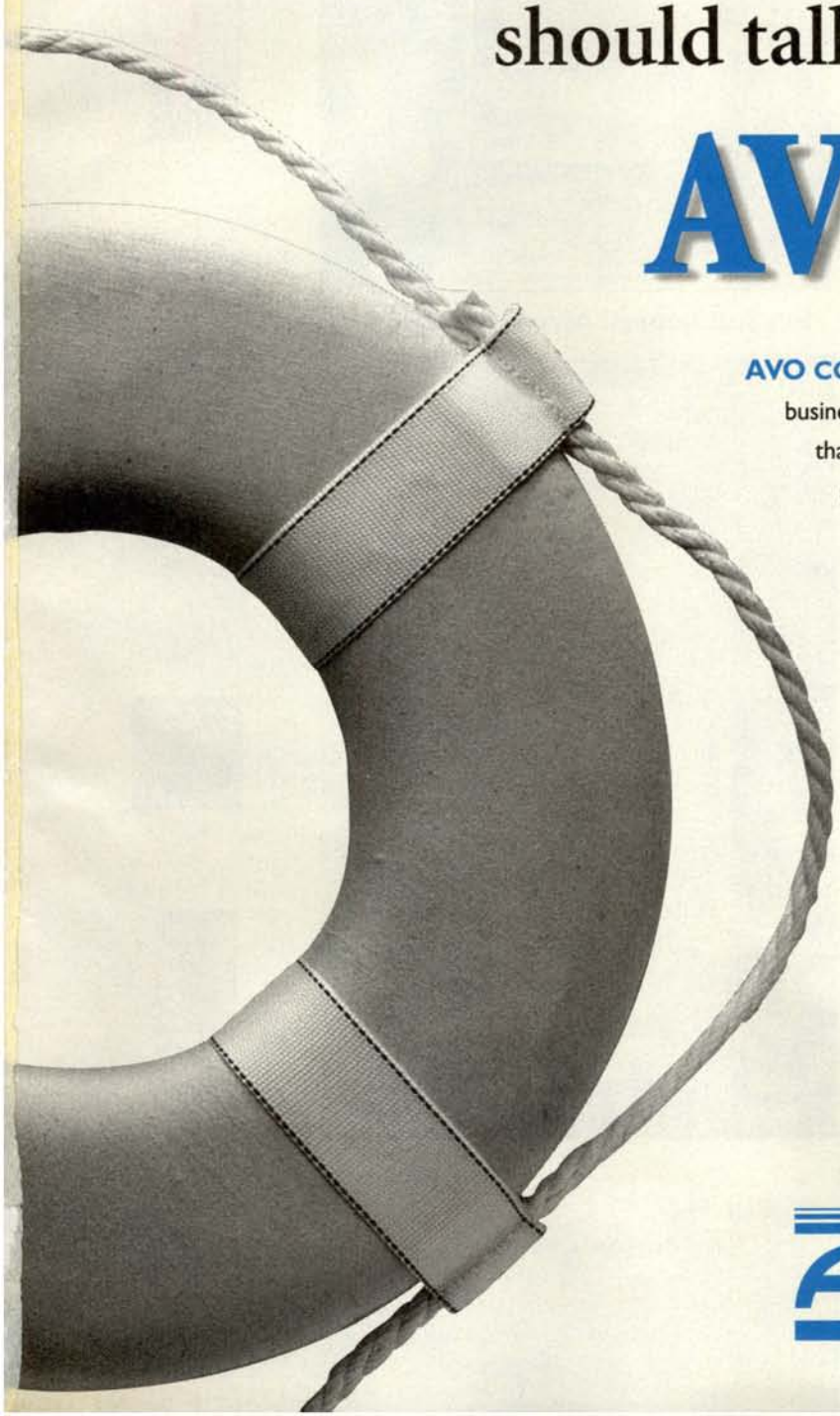

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Editor - PC Magazine, October 1998

"In some of our past labs we've needed to go to the photo to see who has crossed the line first, but this month we have a very clear winner. The Beyond SuperO prosessinal PII impressed the entire team when we set it up due to the high quality of all its components ..... Unsurprisingly, the Beyond also tore through our Benchmark tests, producing a score that not only blew away the opposition but rivalled that of some PII/400 system ..... Incredibly fast and well featured with massive upgrade potential."

Editor - PC@UTHORITY, October 1998

Beyond Professional LX

Intel 333MHz Pentium II MMX Processor

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32Mb SDRAM
Quantum 3.2GB Ultra ATA HDD
Intel i740 Chipset 8MB AGP Video
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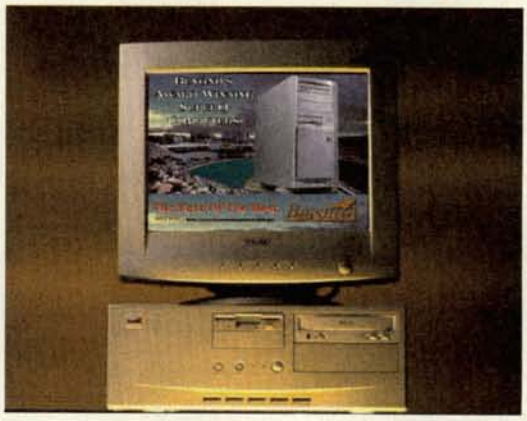
Beyond Ergonomic 104 Keyboard PS/2
Beyond SuperO Midi Tower ATX Case
Logitech PS/2 Mouse
3.5" Floppy & 32X CD ROM IDE
Microsoft Windows 98 and IE 4.0

$1980



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Sony 15" Trinitron Digital Monitor 0.25
Quantum 5.1GB Ultra ATA HDD
Beyond Ergonomic 104 Keyboard PS/2
Beyond SuperO Midi Tower ATX Case
Logitech PS/2 Mouse
3.5" Floppy & 32X CD ROM IDE
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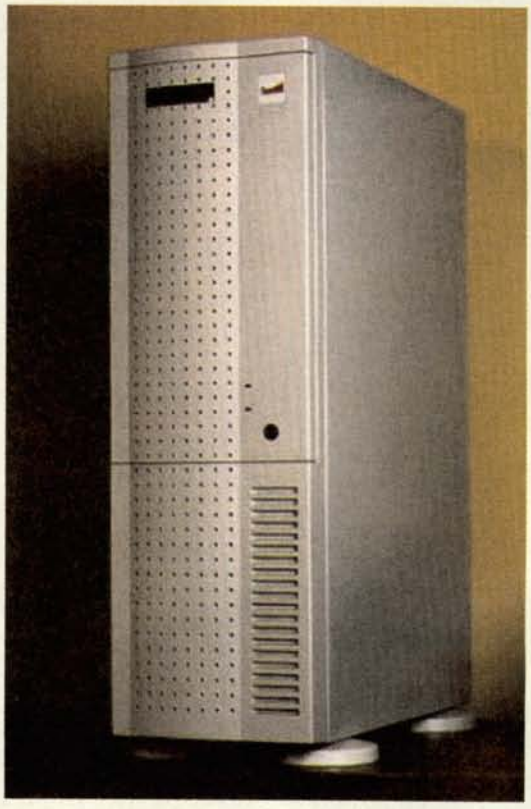

Beyond Velocity BX

Intel 400MHz Pentium II MMX Processor

USA SuperMicro SBA BX Mainboard
64Mb SDRAM PC100
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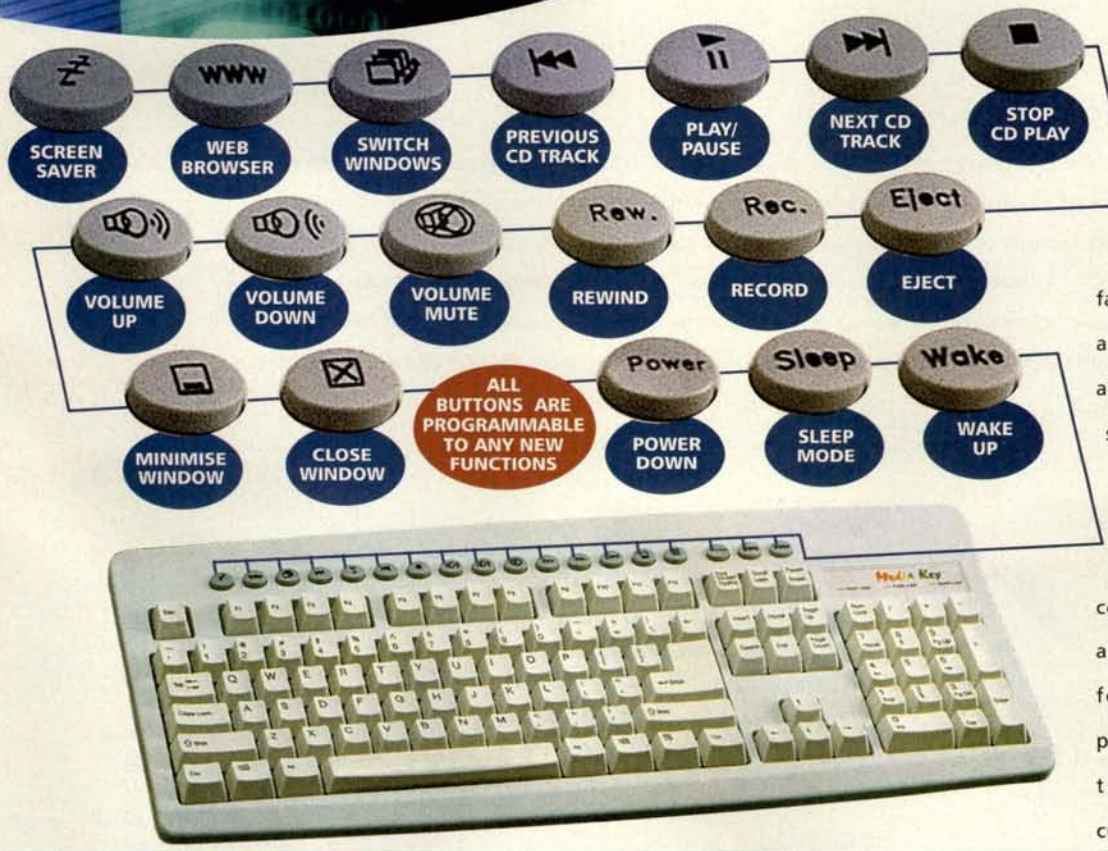

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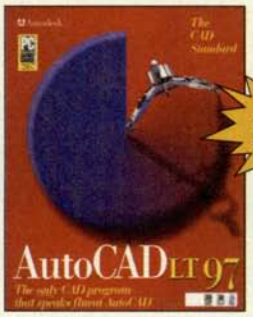

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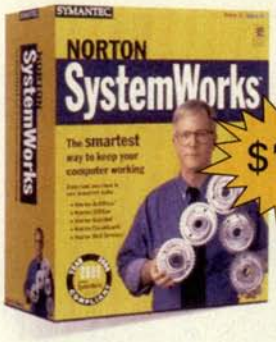

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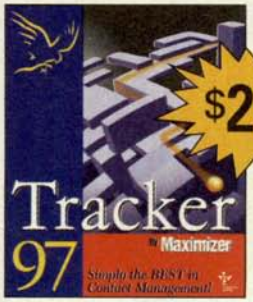

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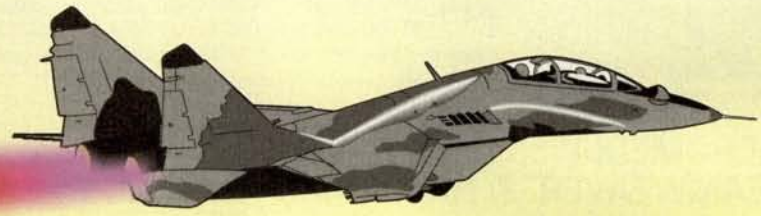

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System Requirements

Minimum 133MHz Pentium Processor IBM Compatible PC with 32MB RAM (Faster with MMX)

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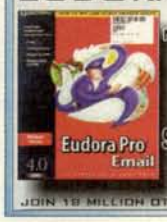

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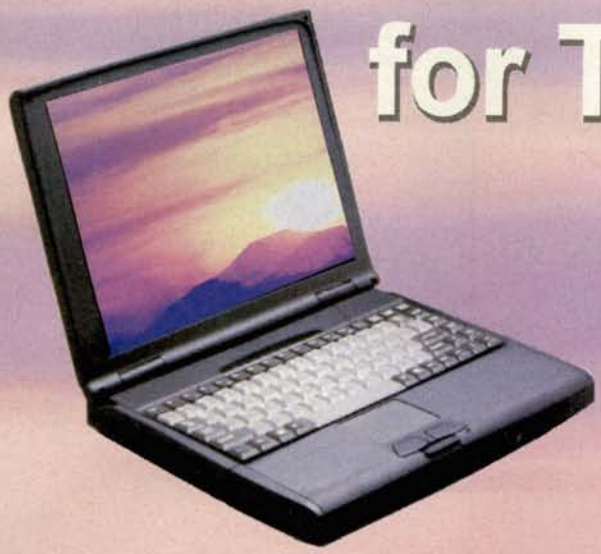

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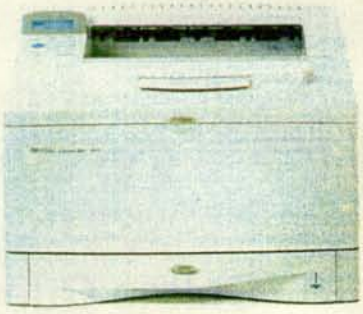

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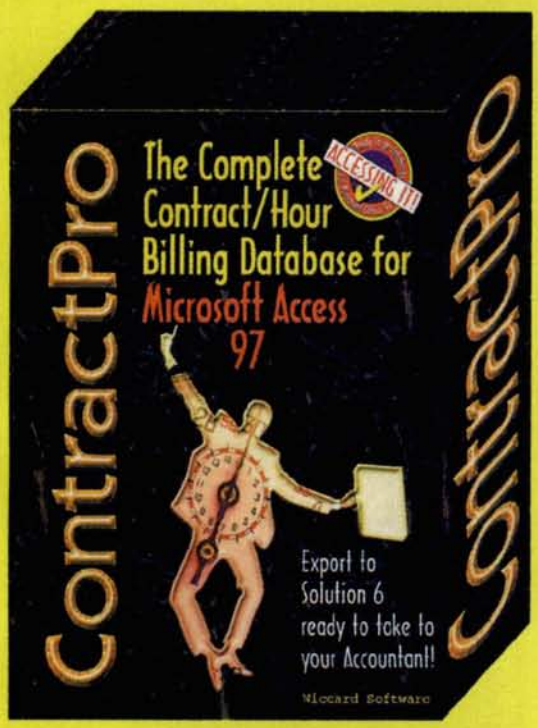

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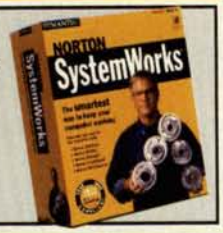

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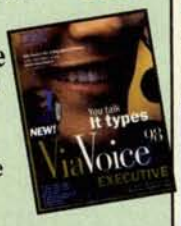

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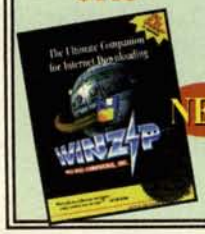

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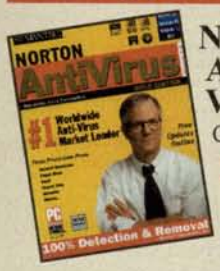

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ADVANTAGE	16MB,32MB,64MB
MANHATTAN	16MB,32MB,64MB

CANON MEMORY

NOTEJET III SERIES	8MB,16MB
NOTEJET 486 ALLMODELS	4MB,8MB
INNOVA SERIES	8MB,16MB,24MB

COMPAQ MEMORY

ARMADA ALL SERIES	16MB,32MB,64MB
LTE, ELITE, LITE	8MB,16MB,32MB
CONCERTO	8MB,16MB,32MB
CONTURA	8MB,16MB,32MB
DESKPRO	16MB,32MB,64MB
PRESARIO	16MB,32MB,64MB
PROLIANT	16MB,32MB,64MB,128MB
COMPANION - HPC	16MB,20MB,32MB

DELL MEMORY

LATITUDE CP, LM, LX	16MB,32MB,64MB
LATITUDE XP,XPi,XPiCD	8MB,16MB,32MB
DIMENSION ALLMODELS	16MB,32MB,64MB
OPTIPLEX ALL MODELS	16MB,32MB,64MB

DEC MEMORY

HINOTE ULTRA II	16MB,32MB,64MB
HINOTE VP,CS, LS	16MB,32MB,64MB
DEC ALPHA	16MB, 32MB, 64MB
DEC PRIORIS	8MB,16MB, 32MB
DEC PC	8MB,16MB,32MB
CELEBRIS	64MB,128MB,256MB KITS
VENTURIS	16MB,32MB,64MB

IBM MEMORY

IBM THINKPAD	8MB,16MB,32MB,64MB
PS/2 (ALL MODELS)	8MB, 16MB,32MB
PS/1 (ALL MODELS)	8MB, 16MB,32MB
RISC 6000	16MB, 32MB,64MB,128MB
VALUE POINT(All Models)	16MB,32MB,64MB
APTIVA (All Models)	16MB,32MB,64MB
PC 300/SERVER	16MB,32MB,64MB,128MB

NEC MEMORY

NEC VERSA 4000, 6000	16MB,32MB,64MB
NEC VERSA 2600,2700	8MB,16MB,32MB
NEC VERSA 5000,500	16MB,32MB,64MB
NEC ULTRA LITE,SL/25C	8MB,16MB,32MB
NEC VERSA E,V,M,P,S	8MB,16MB,32MB
NEC ULTRALITE486SX	12MB,16MB,32MB

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PC-3010,3030,3040,3060,3070	8MB,16MB
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T4850,T4900,1900	8MB,16MB,32MB,64MB
SATELITE-100,200,400	8MB,16MB,32MB,64MB
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T2100 SERIES	8MB,16MB,24MB

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DIAMOND -	MONSTER 3D II -4MB/8MB/12MB
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MATROX -	MILLENNIUM II - 4MB/8MB/12MB
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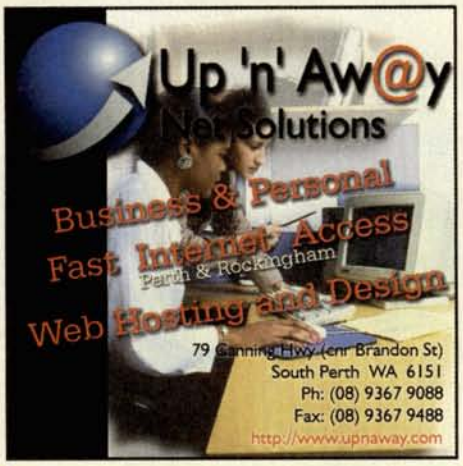

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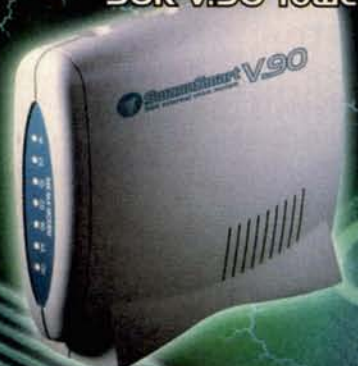

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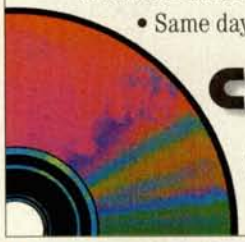

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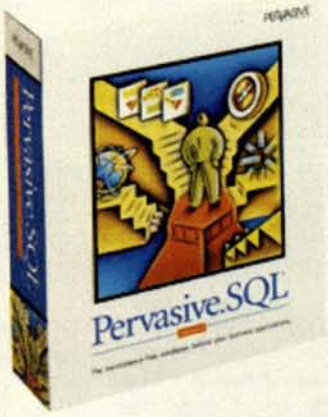

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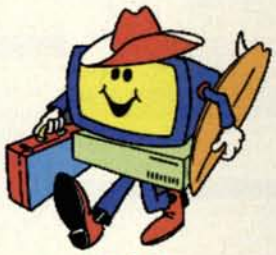

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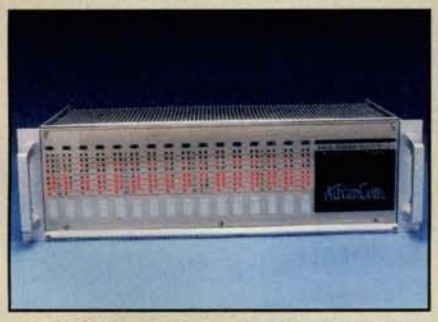

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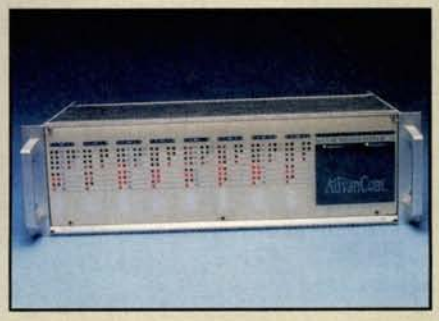

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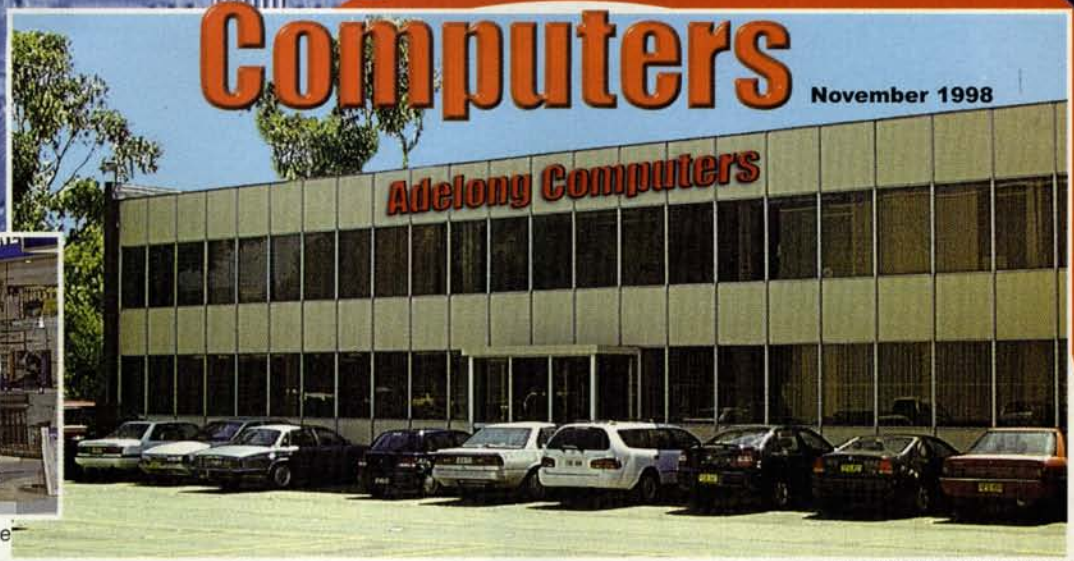

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19 Spirit Modems, US Robotics
20 Syquest storage
21 Iomega
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26 Epson & HP Printers, INK
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Extreme Games Acceleration At Unbelievable Frame Rates

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$245
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DCDIA020
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Iomega Buz

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Adelong Computers

ADELONG ADVANTAGE

NEW

ADVANTAGE CELESTIAL M300
Intel® Celeron Processor 300Mhz

128KB L2 Cache
32MB SDRAM
4.3GB Ultra ATA Hard Disk
32X EIDE CD-ROM Drive
On Board ESS Sound Card
Altec Lansing ACS91 Speakers
4MB AGP Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$1950
SYADE038

RentSmart for $19.45 P/W 36 month term

NEW

ADVANTAGE CELESTIAL M333
Intel® Celeron Processor 333Mhz

128KB L2 Cache
32MB SDRAM
4.3GB Ultra ATA Hard Disk
32/36X EIDE CD-ROM Drive
On Board ESS Sound
Altec Lansing ACS91 Speakers
4MB AGP Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$2095
SYADE039

RentSmart for $21.20 P/W 36month term

ADVANTAGE M333
Intel® Pentium® II Processor 333Mhz

512KB L2 Cache
32MB SDRAM
4.3GB Ultra ATA Hard Disk
32X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS91 Speakers
4MB AGP Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$2215
SYADE040

RentSmart for $22.15 P/W 36 month term

ADVANTAGE M350
Intel® Pentium® II Processor 350Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
6.4GB Ultra ATA Hard Disk
32X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS91 Speakers
8MB i740 Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$2545
SYADE022

RentSmart for $25.15 P/W 36 month term

ADVANTAGE M400
Intel® Pentium® II Processor 400Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
6.4GB Ultra ATA Hard Disk
32X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS91 Speakers
8MB i740 Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$2995
SYADE023

RentSmart for $27.92 P/W 36 month term

ADVANTAGE M450
Intel® Pentium® II Processor 450Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
6.4GB Ultra ATA Hard Disk
32X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS91 Speakers
8MB i740 Graphics Accelerator
15" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

$3395
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RentSmart

With RentSmart, you can get the best business technology, plus keep your money and put it to better use.

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Sydney NSW 2000
Ph: (02) 9267 5272
Fax: (02) 9267 5042

ADELONG ADVANTAGE

POWER ADVANTAGE MP333
Intel® Pentium® II Processor 333Mhz

512KB L2 Cache
64MB SDRAM
6.4GB Ultra ATA Hard Disk
32/36X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS 45 Cube with Sub Woofer
8MB Diamond Stealth II G460 Graphics Card
17" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

RentSmart for $27 P/W 36 month term

$2795
SYADE020

POWER ADVANTAGE MP350
Intel® Pentium® II Processor 350Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
6.4GB Ultra ATA Hard Disk
32/36X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS 45 Cube with Sub Woofer
8MB Diamond Stealth II G460 Graphics Card
17" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

RentSmart for $28.75 P/W 36 month term

$3150
SYADE024

NEW POWER ADVANTAGE MP400
Intel® Pentium® II Processor 400Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
8.5GB Ultra ATA Hard Disk
32/36X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS 45 Cube with Sub Woofer
8MB Matrox Millenium G200 with SDRAM
17" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

RentSmart for $33.46 P/W 36 month term

$3695
SYADE032

NEW POWER ADVANTAGE MP450
Intel® Pentium® II Processor 450Mhz

512KB L2 Cache
64MB 100Mhz SDRAM
8.5GB Ultra ATA Hard Disk
32/36X EIDE CD-ROM Drive
A3D with 64 Voice Wavetable Sound Card
Altec Lansing ACS 45 Cube with Sub Woofer
8MB Matrox Millenium G200 with SDRAM
17" Color Monitor
Microsoft Intellimouse
Deluxe Medium Tower
Windows 98
Vet Antivirus

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$3995
SYADE037

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DTK COMPUTERS

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RentSmart for $27.92 P/W
36 month term

- Intel Pentium II 350MHz
- Intel 440BX Chipset
- 64MB SDRAM
- 6.4GB Ultra ATA Hard Disk
- 8MB Intel i740 AGP Graphics Card
- 17" SVGA Monitor
- PCI Sound Card
- 32 Speed CD-ROM
- 100W Amplified Speaker
- Mid-Tower Case
- Mouse/104 Keyboard
- MS Windows 98

SYDTK000 **$2895**

3 YEAR ON-SITE WARRANTY for all DTK desktop systems

DTK APRI-80M/P400

RentSmart for $30.00P/W
36 month term

- Intel Pentium II 400MHz
- Intel 440BX Chipset
- 64MB SDRAM
- 6.4GB Ultra ATA Hard Disk
- 8MB Intel i740 AGP Graphics Card
- 17" SVGA Monitor
- PCI Sound Card
- 32 Speed CD-ROM
- 100W Amplified Speaker
- Mid-Tower Case
- Mouse/104 Keyboard
- MS Windows 98

SYDTK001 **$3295**

DTK APRI-82/C333

RentSmart for $21 P/W
36 month term

- Intel Celeron 333MHz
- Intel 440EX Chipset
- 32MB SDRAM
- 4.3GB Ultra ATA Hard Disk
- 4MB AGP Graphic Card
- 15" SVGA Monitor
- 16-bit 3D Sound Card
- 32 Speed CD-ROM
- 100W Amplified Speaker
- MicroATX Tower Case
- Mouse/104 Keyboard
- MS Windows 98

SYDTK006 **$1895**

DTK APRI-82/P333

RentSmart for $22.95 P/W
36 month term

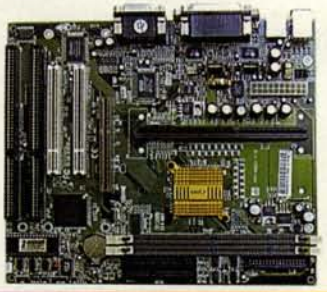
- Intel Pentium II 333MHz
- Intel 440EX Chipset
- 64MB SDRAM
- 6.4GB Ultra ATA Hard Disk
- 4MB AGP Graphic Card
- 15" SVGA Monitor
- 16-bit 3D Sound Card
- 32 Speed CD-ROM
- 100W Amplified Speaker
- MicroATX Tower Case
- Mouse/104 Keyboard
- MS Windows 98

SYDTK003 **$2350**

DTK PENTIUM II/CELERON EX ATX MAINBOARD PRM-0082i

System Processor:
Pentium II/Celeron up to 333MHz
ACPI / Ultra DMA 33 / AGP port
Switching Voltage Regulator
Support 2 DIMM (3.3v) up to 512MB
2 PCI + 2 ISA + 1 AGP slot
ChipSet:
Intel 82440EX
On Board ESS 1938 32 bit Audio

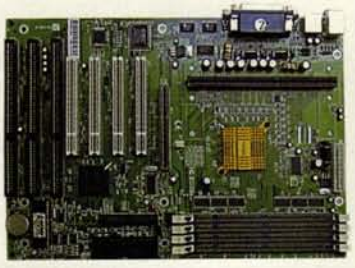
$195
MBDTK010



DTK PENTIUM II BX ATX MAINBOARD PRM-00801

System Processor:
Pentium II up to 450MHz
ACPI / Ultra DMA 33 / AGP port
Switching Voltage Regulator
Support 4 DIMM (3.3v) up to 512MB
4 PCI + 3 ISA + 1 AGP slot
ChipSet:
Intel 82440BX

$255
MBDTK008



FortisPro

2 YEAR WARRANTY

DTK AMDK6- 300

12.1" Active Colour TFT LCD
AMD K6-300MHz CPU with MMX™
Intel TX Chipset, 512KB Cache
32MB RAM
3.2 GB Hard Disk
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2MB EDO Video Ram
89-Key Win95 Keyboard, Touchpad
PCMCIA Port (1x Type III or 2x Type II)
1xSerial, 1xParallel, 1xPS/2, 1xGame,
1xTV OUT, 1xIrDA, 1xUSB, 1xExt Monitor Ports
20x CD-ROM
1.44MB FDD w/External Cable
Li-Ion Battery
AC/DC Adaptor, Carry Bag
Windows 98

NBDTK002 **$3495**

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AMD CPUs

AMD

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Experience the New Reality with the AMD-K6®-2 Processor

AMD - K6 -2 PROCESSOR - WITH 3DNow!™ TECHNOLOGY

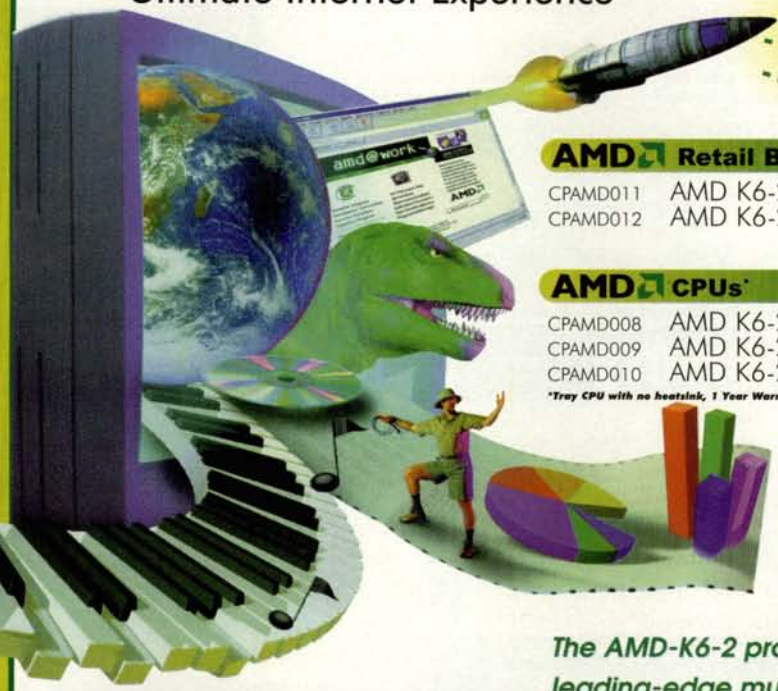
- Leading-Edge Performance
- Lifelike Images and Graphics
- Big-Screen Sound & Video
- Ultimate Internet Experience

AMD-K6-2 Processor

The Smart Choice

PC users are into multimedia computing like never before.

With the new, innovative 3DNow!™ technology, the AMD-K6-2 processor delivers better overall performance* and a superior experience for Windows® computing.



All AMD BOX CPUs Come with
- Heatsink and Fan
- 3 year warranty

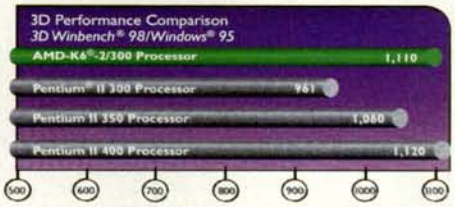
AMD Retail Box CPUs

CPAMD011	AMD K6-2 300Mhz	$315
CPAMD012	AMD K6-2 350Mhz	$590

AMD CPUs*

CPAMD008	AMD K6-2 266Mhz	$230
CPAMD009	AMD K6-2 300Mhz	$285
CPAMD010	AMD K6-2 350Mhz	$565

*Tray CPU with no heatsink, 1 Year Warranty



The AMD-K6-2 processor brings leading-edge multimedia computing to the mainstream. With the AMD-K6-2 processor, PC users get the ultimate in 3D realism and performance-for a realistic price.

Vantage M266 - with 3DNOW!™

AMD-K6-2/266MHz
32MB SDRAM
3.2GB Ultra ATA Hard Drive
32 Speed CD-ROM
PCI Sound Card
New Altec Lansing ACS 91
15' Colour Monitor
Mouse and Pad
104kb Keyboard
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Microsoft Windows 98

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Vantage Gamer M300 - with 3DNOW!™

NEW

AMD-K6-2/300
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A3D with 64 Voice Wavetable Sound Card
8Mb i740 Graphics Card
12MB Voodoo II 3D Accelerator
New Altec Lansing ACS45 with Sub Woofer
15" Colour Monitor
Mouse & Pad
104 Key Windows Keyboard
Deluxe Midi Case Microsoft Windows 98
Vet Anti Virus

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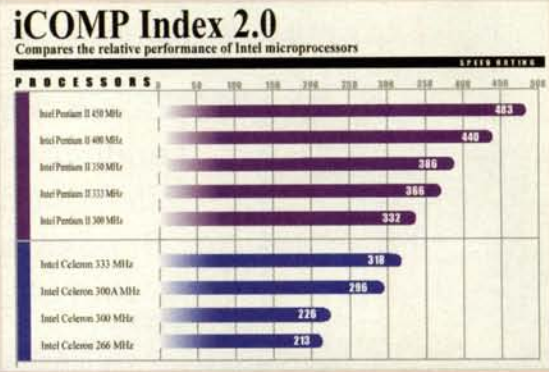
Processors

Code	Model	Price
CPINT014	Pentium II 333	$575
CPINT015	Pentium II 350	$739
CPINT016	Pentium II 400	$1175
CPINT017	Pentium II 450	$1595
CPINT019	Celeron 300	$245
CPINT020	Celeron 300A with Cache	$369
CPINT021	Celeron 333 with Cache	$465



AMD

Code	Model	Price
CPAMD008	AMD K6-2 266	$230
CPAMD009	AMD K6-2 300	$285
CPAMD010	AMD K6-2 350	$565

Cyrix

Code	Model	Price
CPIBM006	M2-233MHZ	$125
CPIBM007	M2-266MHZ	$169
CPIBM008	M2-300MHZ	$199

Memory

SDRAM - For use in current Pentium / Pentium II systems utilising Intel TX / LX / BX Chipsets. 100MHz for Intel BX Chipsets. Use individually. All SDRAM is 168 Pin.

Code	Model	Price
RAGEN008	32MB SDRAM	$85
RAGEN009	64MB SDRAM	$199
RAGEN021	128MB SDRAM	$389
RAGEN022	64MB 100MHz SDRAM	$215
RAGEN023	128MB 100MHz SDRAM	$395

* For use with latel BX & Super Socket 7 Mainboards

EDO RAM - For use in newer 486 systems and most Pentium / Pentium Pro style systems. Used in pairs in Pentiums & Pentium Pro's.

Code	Model	Price
RAGEN004	8MB EDO SIMM 72 Pin	$30
RAGEN005	16MB EDO SIMM 72 Pin	$39
RAGEN006	32MB EDO SIMM 72 Pin	$79

Fast Page RAM - For use in older 486 & Pentium systems and some printers.Use in pairs in Pentiums.

Code	Model	Price
RAGEN001	8MB SIMM 72 Pin	$35
RAGEN002	16MB SIMM 72 Pin	$55
RAGEN003	32MB SIMM 72 Pin	$85

Parity RAM - This error checking ram is used with older desktop systems and servers.

Code	Model	Price
RAGEN011	4MB SIMM 72 Pin	$35
RAGEN012	8MB SIMM 72 Pin	$49
RAGEN013	16MB SIMM 72 Pin	$59

Hard Disks

For details on Seagate and Western Digital Hard Drives see page 8 & 9.

Quantum Fireball EL

Quantum is renowned for **quality** and **performance.** It has a fast average seek time - 9.5 milliseconds and internal data rates up to 158 megabyte per second at 5400 rpm. It also uses the Ultra ATA interface, with a data burst transfer rate of 33.3 megabytes per second. Furthermore the ***Fireball EL is available in both IDE and SCSI models.***

IDE 3.5" - Fireball

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDQTM028	Fireball EL	5.1	512KB	UDMA	33MB/s	$345
HDQTM029	Fireball EL	7.6	512KB	UDMA	33MB/s	$495
HDQTM030	Fireball EL	10.2	128KB	UDMA	33MB/s	$645

SCSI 3.5" - Fireball SE Ultra SCSI

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDQTM023	Fireball SE	3.2	512KB	Ultra	20MB/s	$470
HDQTM024	Fireball SE	4.3	512KB	Ultra	20MB/s	$575
HDQTM025	Fireball SE	6.4	512KB	Ultra	20MB/s	$745
HDQTM026	Fireball SE	8.4	512KB	Ultra	20MB/s	$945

IBM

IBM Ultra DMA33 - DESKSTAR HERCULES EIDE DRIVES

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDIBM006	DHEA 34331	4.3	512KB	UDMA	5400	$359
HDIBM007	DHEA 36480	6.4	512KB	UDMA	5400	$395
HDIBM008	DHEA 38451	8.4	512KB	UDMA	5400	$505

IBM SCSI - ULTRASTAR 9ES DRACO SCSI DRIVES

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDIBM009	DDRS 34560-50	4.5	512KB	Ultra	7200	$655
HDIBM010	DDRS 34560-68	4.5	512KB	U/W	7200	$695
HDIBM011	DDRS 39130-50	9.1	512KB	Ultra	7200	$1210
HDIBM012	DDRS 39130-68	9.1	512KB	U/W	7200	$1265

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$275
MBCHA003

CHAINTECH 6BTM

System Processor:
- Supports up to 450MHz Intel Pentium II processors
- Slot 1 CPU socket with retention mechanism
- Supports 66/100MHz system clock speeds
- Innovative CPU technology (simple CPU installation via BIOS)

ChipSet:
- **Intel 82440BX Chipset PCIset**

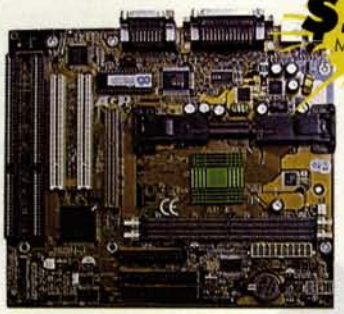
Bios:
- Award System BIOS with PnP, APM, DMI, CPU throttling and Multi-device booting features

Ultra DMA-33 IDE Ports:
- Supports up to PIO Mode 4, Multi-word DMA Mode 2 and Ultra DMA-33 timings
- Bus Mastering software drivers for all well-known multi-task operating systems.

$649
MBCHA004

ON BOARD SCSI

$209
MBCHA005



new **$169**
MBCHA006

AMD-K6-2 compatible

CHAINTECH 6BDU

System Processor Supports up to two 450MHz Intel Pentium® II processors
- Slot 1 CPU socket with retention mechanism
- Supports 66/100 MHz system clock speeds
- Innovative SEEPU technology (simple CPU installation via BIOS)

ChipSet Intel 82440BX two chip PCIset Accelerated Graphics Port (AGP)

DRAM Memory
- Supports up to 512MB EDO and Synchronous DRAM modules
- Purovides single-bit ECC capability

Two Ultra DMA-33 IDE Ports
- Supports up to PIO Mode 4, Multiword Mode 2 and Ultra DMA33 timings
- Bus Mastering software drivers for all well-known multi-task operating systems

Ultra2 SCSI with RAIDport III On Board
- AIC 7880 SCSI controller and AIC-3860 chip, supports up to 80Mbps(Ultra2 SCSI)
- Supports Adaptec ARO-1130CA-C RAID card for RAID system upgradability

ATX Form

CHAINTECH 6ESA

System Processor Supports up to 333MHz Intel Pentium® II & Celeron® processors
- Slot 1 CPU socket with low cost retention mechanism
- Supports 60/66 MHz system clock speeds
- Innovative SEEPU technology (simple CPU installation via BIOS)

ChipSet Intel 82440EX two chip PCIset

Accelerated Graphics Port (AGP)

DRAM Memory
- Two 168-pin DIMM sockets support up to 256MB EDO and Synchronous DRAM • Provides single-bit ECC capability

Two Ultra DMA-33 IDE Ports
- Supports up to PIO Mode 4, Multiword Mode 2 and Ultra DMA33 timings
- Bus Mastering software drivers for all well-known multi-task operating systems

Audio Subsystem
- Yamaha SA3 16-bit stereo audio controller
- Programmable sample rates from 5.5KHz to 48KHz for record and playback with full-duplex DSVD capability
- Supports DLS(Downable Wavetable Sounds) wavetable synthesiser with limitless varieties of instrument samples using system DRAM

Micro-ATX Form

CHAINTECH 5AGM2

System Processor Supports up to 233MHz Pentium processors with MMX™ technology
- Supports Intel Pentium OverDrive processors (P54CTB)
- Supports PR120+-PR200+Cyrix/IBM 6x86™ (processor rev. 2.7 or later)/6x86L™ processors and PR166+-PR266+ 6x86MX and MII-300 processors
- Supports 166-350MHz K6™ and K6-2™ processors
- Supports 180-200MHz IDT WinChip MMX processors
- High-efficiency Switching Power module
- Supports 60/66/100 MHz system clock speeds
- Supports 2.0-3.5v CPU core voltage

ChipSet VIA MVP3 (82C598AT/82C586) two chip AGPset

Accelerated Graphics Port (AGP)

L2 Cache • 512KB built-in Pipeline Burst SRAM

DRAM Memory
- Three 168-pin 3.3v unbuffered DIMM sockets support up to 256MB FP, EDO, Synchronous DRAM modules. PC66 & PC100 SDRAM Compatible

Two Ultra DMA-33 IDE Ports
- Supports up to PIO Mode 4, Multiword DMA Mode 2 and Ultra DMA33 timings
- Bus Mastering software drivers for all well-known multi-task operating systems

Two USB Ports On Board / FCC Class B & CE EMI Regulation Compliant

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
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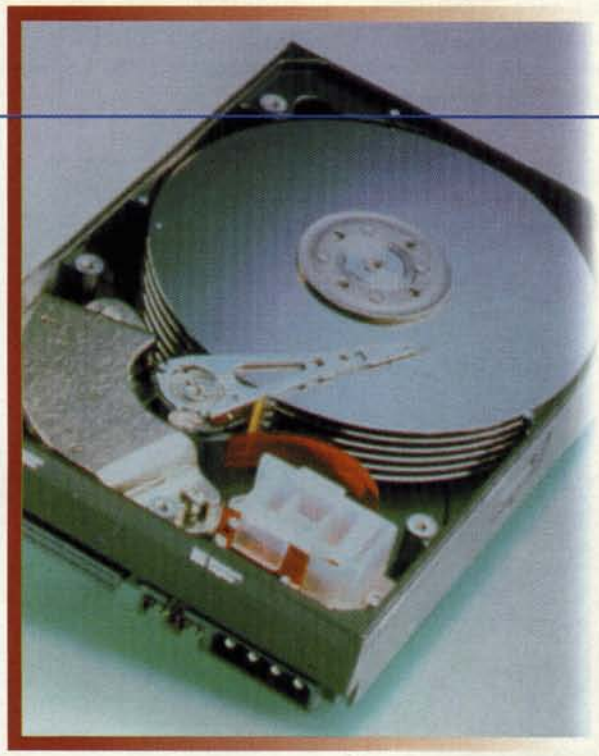
HARD DRIVES



Western Digital

WD Caviar®

Average Read Seek	9.5 ms
Rotational Speed	5400 RPM
Buffer	256 KB

PHYSICAL SPECIFICATIONS

	Formatted Capacity	Model Number	
HDWES002	4.3 GB	WDAC24300	**$325**
HDWES003	6.4 GB	WDAC36400	**$389**
HDWES004	8.5 GB	WDAC38400	**$485**
HDWES005	10.1 GB	WDAC310100	**$590**

Western Digital's latest family of Caviar hard drives, and proven drive technology with an areal density of 2.875 GB per platter.

Using the industry-recognized 3.5-inch, low-profile WD Caviar design, these drives incorporate leading-edge magnetoresistive head technology to meet increasing capacity requirements. Read and write elements in the in the MR head are separate in order to optimize read and write capabilities. The read element, composed of a thin-film material whose resistance changes in the presence of a magnetic field, produces a strong signal allowing significant increases in areal densities.

These drives support Mode 4 PIO, Mode 2 DMA, and Ultra MB/5--double the current burst transfer rate. This results in maximum disk performance under PCI local bus environments.

- **MR Head Technology -** Magnotoresistive heads provide separate read and write elements, allowing optimization of the two functions for increased areal density and improved performance of the hard drive.
- **Ultra DMA/33 High-speed Host Transfers -** Doubles the current transfer rate under local bus environments.
- **S.M.A.R.T-TM -** Assists the use in preventing possible system down time by warning users of the impending risk of data loss.
- **Exceptional Quality -** Guaranteed compatibility and automatic defect management allows easy instalation. A three year warranty and 400,00 MTBF means years of trouble-free operation.

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HARD DRIVES

Seagate

Seagate Medalist

Seagate Medalist, EIDE drives from the worlds largest hard drive manufacture. They combine performance with great reliability. Designed for multimedia systems it has a seek time of 11ms, a motor speed of 5400rpm and supports the Ultra ATA interface.

EIDE – Medalist

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDSGT018	Medalist	3.2	128KB	Ultra ATA	4500	$270
HDSGT019	Medalist	4.3	128KB	Ultra ATA	5400	$305
HDSGT016	Medalist	6.5	128KB	Ultra ATA	5400	$385
HDSGT020	Medalist	8.6	128KB	Ultra ATA	5400	$500

Seagate Medalist Pro

One of the first 7200rpm EIDE drives available. It runs at a blazing 7200rpm and supports the Ultra ATA interface. The Medalist Pro range is geared for the power user and has a super fast seek time of 9.5ms.

EIDE – Medalist Pro

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDSGT021	Medalist Pro	6.5	512KB	Ultra ATA	7200	$490
HDSGT022	Medalist Pro	9.1	128KB	Ultra ATA	7200	$705

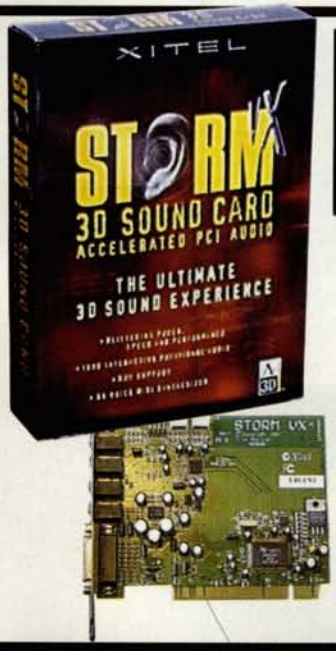
Seagate Barracuda

For high end servers where performance is vital. The barracuda range come in Ultra or UltraWide SCSI interfaces. These drives are manufactured to unparrallel performance and reliability.

SCSI – Seagate Barracuda

Code	Model	GB	Cache	I'Face	Motor RPM	Price
HDSGT011	Barracuda 4XL	4.5	512KB	Ultra	20MB/s	$1045
HDSGT012	Barracuda 4XL	4.5	512KB	U/W	40MB/s	$1150
HDSGT013	Barracuda 9	9.1	512KB	Ultra	20MB/s	$1425
HDSGT014	Barracuda 9	9.1	512KB	U/W	40MB/s	$1425
HDSGT023	Barracuda 18	18.2	512KB	U/W	40MB/s	$2595

SOUND CARD



STORM VX 3D SOUND CARD
ACCELERATED PCI AUDIO

The Ultimate 3D Sound Experience

Let Your ears experience the pin point accuracy of true interactive audio. Storm VX packs all the features you'd expect in a high-end audio product meaning you can crank it loud without any sense of distortion. Whilst maintaining compatibility with DOS and Windows games can experience realistic 3D sounds and music.

- Hardware Acceleration
- Aureal A3d Positional Audio
- 64 voice wavetable synthesis
- Direct Joystick Acceleration

$120
MMXIT000

A3D INTERACTIVE

XITEL

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DIAMOND MULTIMEDIA

www.diamondmm.com.au

Sonic Impact S90

Hot 3D Wavetable Audio!

Diamond's Sonic Impact S90 uses advanced A3D technology to bring life-like positional 3D game play to your PC. Sonic Impact S90 includes hardware acceleration for 64 wavetable voices and Aureal's A3D to immerse you in the middle of the action. Add realistic atmospheric effects, including fog and underwater sounds, and you have total audio transformation for your PC.

- PCI design for faster system performance
- 64 Hardware wavetable voices
- Supports downloadable samples
- Runs with DOS, Win95/98, Win NT 4.0

MMDIA010 **$130** RETAIL

MMDIA008 **$84** OEM

Monster Fusion

2D & 3D Acceleration

Monster Fusion combines 16MB of 3D gaming power with fantastic 2D graphics acceleration, all in a single card. Diamond has built on 3Dfx's Voodoo Banshee technology to deliver 1920 X1440 resolutions and 60+ frames/second game play. Yes, it's Fusion Time, baby!

- Available in PCI and AGP configurations
- Supports Glide, Direct3D and OpenGL API's
- Explosive software bundle in special retail packs

DCDIA019 **$299** AGP OEM

DCDIA020 **$365** AGP RETAIL

DCDIA021 **$345** PCI RETAIL

Viper V550

The Viper V550 from Diamond features unprecedented 128-bit power for the state-of-the-art 2D graphics and stunning 3D quality for high-speed game play, business and professional graphics. Fully optimised for Windows 98, Viper V550 is the next generation in high performance graphics acceleration. Available in PCI and AGP 2X configurations

- Featuring 16MB of SDRAM
- 128-bit dual processor architecture
- Accelerates OpenGL and DirectX
- Supports software DVD

16MB

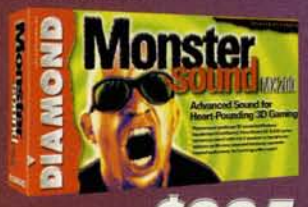
DCDIA016 **$465** PCI

DCDIA018 **$455** AGP

Monster Sound MX200

Fully Immersive Audio!!!

Monster Sound MX200's revolutionary NASA audio technology, 64 hardware wavetable voices and PCI design make it the best audio accelerator for today's games. Supports Aureal A3D, DirectSound, DirectSound 3D.



- 4 speaker support for maximum 3D effects
- Accelerates 23 3D audio streams
- 4MB Roland wavetable sample
- Hardware A3D acceleration

$335
MMDIA000

PC MAGAZINE AUSTRALIA EDITORS' CHOICE (July 1998)

Stealth II G460

8MB of AGP 2X Graphics Power

Let your PC show you brilliant colours and razor-sharp resolution. Stealth II G460 includes 8MB of SDRAM with AGP 2X power to make games and business applications come alive. Designed for use with Intel Pentium II processors.

- 8MB SDRAM
- Powerful 2D and 3D acceleration
- Supports Windows 95/98 and Windows NT 4.0

AGP Retail **$275** DCDIA014

AGP OEM **$175** DCDIA013

FirePort UltraSCSI

UltraSCSI with Diamond Performance

- Supports Windows 95/98, Windows NT 4.0, Novell Netware
- External 50-pin connector means you don't need an extra adapter
- Top performance UltraSCSI just got affordable
- Free UltraEasy™ Diagnostics

FirePort 20 **$169** CCDIA000

FirePort 40 **$310** CCDIA001

FirePort 40 Dual **$409** CCDIA002

Monster 3D II

Most Powerful Voodoo2 Acceleration!

This is 3D more shockingly real than anything you've ever seen! Outrageous speed and deadly detail will transform your PC gaming into a mind blowing 3D experience. Can you meet the challenge of 100 frames/sec game play with 2 Monster 3D II's in SLI mode?

- 60 frames/sec with a single card
- Supports Glide, Direct3D and OpenGL
- Hot game bundles in special retail packs

8MB **$429** MMDIA003

12MB **$530** MMDIA007

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Extreme Games Acceleration At Unbelievable Frame Rates

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Mystique G200

- 128 bit DualBus High Performance Gaming Engine with full AGP 2X support.
- 8MB of graphics memory upgradeable to 16MB
- High Quality 3D rendering engine delivers blistering gaming performance.
- High octane video - engine for Mpeg1 and Mpeg2 video acceleration.
- PC to TV output, brings flicker free displays right to your television screens.

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DCMAT023

Millennium G200

Superior Acceleration For Professional 2D/3D Graphics

- High speed 250MHz RAMDAC
- Fully multimedia upgradeable
- High quality 3D rendering engine
- High performance video card withfull AGP 2X support
- New MGA-G200 128-bit DualBus graphics chip
- 8MB of graphics memory upgradeable to 16MB
- Advanced 2D, 3D, and software DVD video acceleration

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PC @uthority September 98

Productiva G100

Acceleration For Demanding Business Graphics

- 64-bit AGP graphics card
- 8MB of powerful graphics memory
- High performance 2D business productivity
- Support for 3D and video-based business applications
- 1600 x 1200 desktop in true colour for demandingbusiness documents

(8MB)
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DCMAT021

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...for FOR THE ULTIMATE 2D/3D GAME EXPERINCE!

Features:
- 12MB of high performance EDO RAM
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- Full Direct3D hardware acceleration and compatible with 3Dfx Glide titles
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12MB

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DCEAG004

EAGLE i740 AGP VGA CARD

FOR BLISTERING PERFORMANCE AT AN AFFORDABLE PRICE!

Features:
- Using Intel 740 High Performance chipset
- Full AGP 1.0 compliant and Full feature AGP 2x Implement
- 3D Graphics Enhancements:
- Support High-Quality MPEG1 and MPEG2 playback
- Supports DirectX and OpenGL

DCEAG005 **$119**

3D FX VOODOO 3D Accelerator

...for 3D graphic enhancement!

Features:
- High Performance 4MB card utilising industry leading 3DFX VooDoo Chipset
- Unrivalled games performance with electrifying frame rates
- Works with any conventional 2D card

DCEAG002 **$150**

DCEAG001 2MB S2 Virge 3D PCI VGA Card **$53**
DCEAG001 4MB S2 Virge 3D PCI VGA Card **$66**
MMEAG001 ES1938 (SOLO-1) PCI Sound Card **$39**

3D Gaming

WINCAST TV TUNER CARD

WinCast/TV

PCI-BUS TV, IMAGE CAPTURE AND INTERCAST DATA RECEPTION!

WinCast/TV is a single slot PCI card which has a 125-channel cable-ready TV tuner and a video digitizer.

With WinCast/TV you can:

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- input from your VCR or Cam Corder
- snap still video images
- grab motion video movies
- videos conference with PC video conerencing software like NetMeeting, CU-SeeMe, IPhone, VDOphone and more!

Plug-and-Play Installation

WinCast/TV's motion video capture will make digital video movies on your PC's hard disk.

Capture professional quality 24-bit video images with 4:2:2 digitizing.

Live TV-in-a-window on VGA monitors from 640x480 to 1280x1024 in up to 16 million colours.

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SCANNERS UMAX

Astra 1220 *series* - Includes Adobe PhotoDeluxe!

The Affordable 36 bit professional scanning solution

The Astra 1220 series was designed specifically for corporate or small office users who want somthing more from their scanner. Built with a 36 bit colour CCD, the Astra 1220 captures an amazing 68.7 billion colours to bring all your images to life. A complete range of easy to use software is included with the 1220, making it a versatile tool for any user. Perform OCR with astonishing accuracy or scan images to add a splash of colour to your documents. The opportunities are endless with the UMAX Astra 1220.

- 1200 x 600dpi optical resolution for crisp, vibrant images
- 9600dpi max. resolution for smooth lineart & image magnification
- A 36 bit colour depth captures 68.7 billion colours
- A4 scanning area (216 x 297mm)
- Single pass colour CCD for fast, productive scanning

122OS **$695** SCSI IOUMA005

122OU **$695** USB IOUMA006

122OP **$335** PARALLEL IOUMA004

Astra 610 *series*

The compact plug 'n' play colour scanner for home and office users

Add the colour and vitality of images to everything you do on your computer with a new Astra 610 series scanner. After plugging it in and installing the software, simply press the 'on' button at the front of the scanner and you're ready to go - it's that easy!

- 600 x 300dpi optical resolution for crisp, vibrant images
- 4800dpi max. resolution for smooth lineart & image magnification
- Captures over 1 billion colours through 30 bit scanning
- A4 scanning area (216 x 297mm)
- Single pass colour CCD for fast, productive scanning
- Extensive software package handles all your creative and scanning needs

610P **$195** IOUMA002 PARALLEL

610S **$390** IOUMA003 SCSI

SCSI Interface Included

DIGITAL CAMERAS & SCANNERS Nikon

Nikon LS-2000 Film Scanner

The new Nikon Super Coolscan 2000 is a high resolution 2700 dpi, 12 bit A/D scanner able to scan each image in just 20 seconds. The new Coolscan 2000 uses new 'CleanImage' technology removing dust, scratches and other defects from the image.

- Full colour 2700 dpi scans in 20 seconds
- Batch Scanning
- Hot Swappable adapters - Film Strips or APS Film Adaptor, auto Slide Feeder
- Negatives or Transparancies
- Adobe Photoshop LE

IONIK000 **$2450**

Nikon LS-30 Coolscan III Film Scanner

The new LS-30 Coolscan III is a 2700 dpi, 10 bit A/D conversion scanner which will scan at full resolution in just 30 seconds. The Coolscan III uses CleanImage™ dust and scratch removal.

- Full colour 2700 dpi scans in 20-30 seconds
- Hot Swappable adaptors - Film strips or APS Film Adaptor
- Nikon Colour Management
- Negatives or Tranparancies
- Adobe Photodeluxe™ 2.0

IONIK001 **$1359**

Nikon Coolpix 900 Digital Camera

The Coolpix 900 is a 1.3 million pixel digital camera. It uses a traditional 9 element Nikkor lens including a 3 x Optical zoom, precision 945 focus steps and 3 metering modes to capture true Nikon quality shots.

- High Resolution 1280 x 960 pixels - JPEG format
- Compact Flash memory card
- High Res 114000 pixel TFT LCD screen + Optical viewfinder
- 3 x Optical Zoom and 2 x digital doubler
- Accepts fisheye and wideangle Nikkor converters
- Spot, Centre weighted and Matrix metering options
- 2 frames a second in VGA mode
- Adobe PhotoDeluxe™ software
- AC Adaptor available
- Built in Flash

IONIK002 **$1849**

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A single drive that does it all. Reads, writes, Rewrites CD data.

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32X CD ROM KIT

- High Speed 32 X MAX
- CD ROM drive, CDRW Read Compatible
- Bonus Webster's World Encyclopedia 1998 Full Version.

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Ricoh CD-R Disc 74 Mins 650Mb
MMRIC004 **$4**

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MMRIC003 **$35**

Fast writing and reading 6x read 2x write, CD-RW and CD-R writing, unlimited media selection

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Internal EIDE CD-R/CD-RW Drive
Direct CD Ver. 2.0, Easy CD Creator 95/NT, 1 CD-R Disc, 1 CD-RW Disc Operation Manual, Audio Cable, Mounting Screws

$650
MMRIC001

MP6200SR (SCSI)

Internal SCSI CD-R/CD-RW Drive
Direct CD Ver. 2.0, Easy CD Creator 95/NT
4 CD-R Disc, 1 CD-RW Disc
Operation Manual, Audio Cable, Mounting Screws

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MMRIC000

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- Total protection for your equipment

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For small businesses

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- Total protection for your equipment
- Power protection with backup
- Solution pack software included
- Fax/Modem line filtering

Code	Model	Price
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- Power grid comes with 4 individually wired plugs.

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BUBAC002	Backpack PD / CD Drive + Soundcard	**$535**
BUBAC003	Backpack 8GB Tape Backup 8000T Travan Drive	**$395**
BUBAC004	Backpack 2.1Gb Hard Drive	**$599**

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- Easy to install
- Affordable
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4x/12x **SCSI** Recorder
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MMTRA002 **$795*** (Int.)
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Re-Writable Driver CDRW4260 EL PRO

4x Record/2x Erase/6x Playback **SCSI** Recorders packed complete with:
- WinonCD 3.5 CD Mastering Software (OEM version)
- Packet CD UDF Recording Software for Win95®
- CD Marker Pen
- Manuals

MMTRA005 **$895*** (Int.)
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Re-Writable Driver CDRW2260 EL PLUS

2x Record/2x Erase/6x Playback **IDE** Recorders packed complete with:
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- Packet CD UDF Recording Software for Win95®
- Cable
- CD Marker Pen
- Manuals

MMTRA004 **$625** (Int.)
MMTRA018 **$795** (Ext.Parallel)

Re-Writable Driver CDRW2260 EL PRO

2x Record/2x Erase/6x Playback **SCSI** Recorders packed complete with:
- WinonCD 3.5 CD Mastering Software (OEM version)
- Packet CD UDF Recording Software for Win95®
- CD Marker Pen
- Manuals

MMTRA016 **$699*** (Int.)

*add $100 to include Ultra SCSI Adaptor

1.2GB Data Storage Capacity for all recorder kits

For PCI Bus

SCSI card kit

$139

MMTRA006

Other Items

Code	Model	Price
MMTRA009	Just Audio	$85
MMTRA010	CD labelling kit	$85
MMTRA011	50 Labels multi col.	$35
MMTRA007	BLANK CD-R	$3.50
MMTRA008	BLANK CD-RW	$29
SWTRA007	WinonCD Pro V3.5	$185

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DIAMONDTRON Monitor, with the super-fine aperture grille pitch of 0.25mm

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Maximum Resolution 1280x1024

19.7" True viewable

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The new standard in diskette storage.

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BUMIT000	Mitsubishi LS – 120 – 120MB Capacity.	$180

Mitsubishi LS-120 FACTS:

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- Bootable, can act as a Boot Drive when appropriate BIOS installed

BUMIT001	120MB capacity diskettes to suit LS – 120 Drive	$25

Code	Model	Price
FDMIT000	Mitsubishi Diamond Data 1.44MB Floppy disk drive.	$36
MMMIT002	6x2 CD Rewriter 6206D IDE KIT+SW+CD	$650
FMMIT000	Diamond Voice V.90 56K Internal Modem	$140
FMMIT001	Diamond Voice V.90 56K External Modem	$150

new

Code	Model	Price
MMMIT003	Mitsubishi Diamond Data 36X CD-ROM	$125
MMMIT001	Mitsubishi Diamond Data 32X CD-ROM	$115

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$49 IOMIT001

Mitsubishi Diamond Touch Economical Keyboard

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14" colour monitor with state-of-the-art design creating a slim profile.

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- 14" flat screen monitor
- 0.2775mm dot pitch
- Anti-glare, anti-static coating
- On-Screen display controls
- 1024x768 max.res.
- 14" viewable area

$2095 MOPAN002

PanaSync™ E50i

Excellent Value Multi-Scan Display with Higher Picture Quality and Convenience.

Specifications

- 15" diagonal flat screen
- 0.28mm dot pitch
- Anti-static, Anti-glare coating
- 1024x768 max.res.
- 14." viewable area

$360 MOPAN008

PanaSync PL70

17" Digital Multiscan colour FST display. The monitor that's very sharp and compact in size.

Specifications

- 17" flat screen monitor
- 0.25mm dot pitch
- Advanced anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 16" viewable area

$1025 MOPAN009

PanaSync E70

Energy-Saving 17" Display with Automatic frequency selection from 30K - 70kHz.

Specifications

- 17" flat screen monitor
- 0.27mm dot pitch
- Anti-glare, anti-static coating
- On-Screen display controls
- 1280x1024 max.res.
- 16" viewable area

$685 MOPAN010

PanaSync SL90

19" monitor with a large 18" true viewable area. Super sharp and compact in size.

Specifications

- 19" flat screen monitor
- 0.25mm dot pitch
- Advanced anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 18" viewable area

$1445 MOPAN011

PanaSync S110

The 21" monitor that takes brightness to a new level and places its focus on high image quality.

Specifications

- 21" flat screen monitor
- 0.25mm dot pitch
- Anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 20" viewable area

$2149 MOPAN001

Storage Devices Panasonic

LS 120 120MB LKM-F434-1

- Lge storage cap. of 120MB in a single LS-120 diskette
- 100% compat. with existing 3.5" diskette media
- Supported by MS DOS, Windows (3X, 95, NT)
- 5 x faster than stand. 1.44MB drives-using LOS-120 disk.
- Boot., can act as a Boot Drive when approp. BIOS inst.

BUPAN000 **$175**

New Drives using state-of-the-art technology for high capacity data storage

CD ROM 32X CR-588-B

Panasonic CD-Rom Drive with an excellent reputation for reliability for performance. Superfast 32x speed reading, this can also read CDRW disc.

MMPAN002 **$125**

ZIP Drive JU-811T01

- 100Mb Capacity (70 FDDs)
- Able to transmit image files, desktop publishing, music files and video clips
- Data transfer rate: Sustained up to 11.2 Mbits/Sec, Burst Up to 26.7 Mbits/sec
- Comes with free software Toolbox for Zip

BUPAN001 **$165**

CD Recordable (4Wx8R) CW-7502-BAB

CD-Recordable Drive Kit, 4-speed write/8-speed read bundles with software & SCSI interface

MMPAN003 **$735** (KIT)

MMPAN004 **$570** (BARE DRIVE)

CD ROM SCSI 24X CR-508-BPA

Panasonic CD508B SCSI 2 CD-Rom drive is one of the best performing drives available. Super fast access time of 85ms and 3600KB/s sustained transfer rate.

MMPAN001 **$175**

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
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Adelong Computers

MONITORS & CD DRIVES

THREE YEAR on-site warranty!

Hansol 701A

Full featured professionals 17" (15.7 viewable), full square high resolution flat face colour monitor with 0.28 dot pitch.

Specifications:
- Easy to use
- Fully supports Windows 95
- Resolution of 1280 x 1024 at 60Hz(N/I)
- Bandwidth (-3dB) 110Mhz
- Microprocessor
- Plug & Play
- Display area of 320 x 240mm
- User control with Power Switch, Reset, Manual Degaussing, Contrast & Brightness
- Power saving (DPMS)
- Standard EMI, Safety, Ergonomics & low rad.

$675 MOHAN004

AWARD WINNING MONITOR

Hansol 700P

Full featured professionals 17" (15.7 viewable), full square high resolution flat face colour monitor with 0.26 dot pitch.

Specifications:
- Easy to use
- Fully supports Windows 95
- Resolution of 1600 x 1200 at 66.6Hz(N/I)
- Bandwidth (-3dB) 135Mhz
- Microprocessor
- Plug & Play
- Display area of 320 x 240mm
- User control with Power Switch, Reset, Manual Degaussing, Contrast & Brightness, H/V size, Tilt, Colour control
- Power saving (DPMS)
- Standard EMI, Safety, Ergonomics & low rad.

$775 MOHAN005

Hansol 401A

14" Diagonal colour monitor also available - 280 x 210mm with 0.28 dot pitch.

Specifications:
- Resolution of 1024x768 at 60Hz(N/I)
- Bandwidth (-3dB) 65Mhz
- Microprocessor
- Plug & Play
- Display area of 274x206mm
- Standard EMI, Safety, Ergonomics and low radiation.

$255 MOHAN000

Hansol 500A

15" Diagonal colour monitor 280 x 210mm with 0.28 dot pitch.

Specifications:
- Easy to use
- Fully supports Windows 95
- Display area of 280 x 210mm
- Ergonomics and low radiation
- Resolution of 1024 x 768-60Hz
- Standard EMI, Safety,
- Bandwidth 65Mhz
- Universal Power
- Microprocessor
- Microprocessor
- Plug & Play

$355 MOHAN001

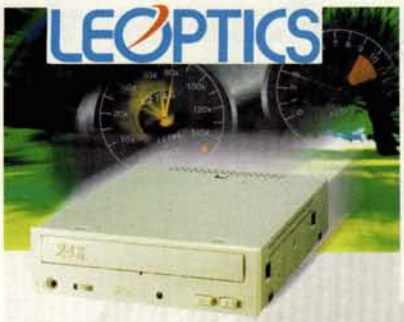
Hansol 500M

15" Diagonal colour monitor 280 x 210mm with 0.28 dot pitch.

Specifications:
- Easy to use
- Fully supports Windows 95
- Display area of 280 x 210mm
- Ergonomics and low radiation
- Resolution of 1024 x 768-60Hz
- Standard EMI, Safety,
- Bandwidth 65Mhz
- Universal Power
- Microprocessor
- Microprocessor
- Plug & Play

$375 MOHAN003

LEOPTICS



32X CD-ROM Drive

- Intelligent latest advanced technology
- Has a good suspension for vibration control
- Front panel with a direct Audio CD play function button
- High data transfer rate-- 4800 KB/Sec.
- Data access speed is powerful-- 100 msec.

$100 MMLEO001

CD-Recordable/Re-Writable Multi-function Disc Drive

- Unique multi-function concept combining 6x CD-ROM reader, 2x CD-Rewritable drive
- IDE/ATAPI interface - no need for costly SCSI adaptors
- Supports TAO (Track At Once), DAO (Disc At Once), MS (Multi-Session), fixed and variable (Incremental Packet) writing modes, as well as CD-DA, CD-ROM (XA), CD-Bridge, Multi-Session, CD-I, Video-CD and CD-UDF disc formats

$590 MMLEO002

CTX

The EZPro 500 projector is great for presentations, multimedia and home theatre. Light in weight, these units are portable and very affordable in price.

$3650 MMCTX000

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Sydney NSW 2000
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Fax: (02) 9267 5042

SPIRIT

SPIRIT

PCMCIA

Spirit Scorpion 56 FMSPI009 **$279**

The Spirit Scorpion 56 fax/modem PC Card offers the features of a desktop fax/modem in a small "credit-card" size. Both KFlex and V90. Ready, the Scorpion 56 is a breeze to install and comes supplied with a full compliment of software. This PC Card enables the mobile professional to exchange data faster using a range of notebooks/palmtops running Win 3.1x/95/98/NT/CE.

PCMCIA Ethernet Adaptor NWSIP000 **$149**

MODEMS

NEW MODEL

K56 Flex + V.90

Spirit 560SP External 56,000bps FMSPI007 **$195**

Internet Voice fax/modem with Speakerphone + SVD external 56k high speed fax/modem that supports the Rockwell K56Flex standard and popular data & fax standards up to 33,600bps. Hardware based error correction & data compression. Includes Windows fax and communications software with voice mail system, plus Windows Internet software.

All Modems include:

- 9/25 serial cable and Power supply(ext. model)
- Phone cord (all models)
- Installation instructions & documentation
- Software: Internet dialler & browser, data terminal emulation software, send receive fax application and voice mail system

560ISP Internal 56K Model
$169

Spirit Ranger 56K
$99 FMSPI008
SPECIAL PRICE with any Adelong System. Call for details.

Code	Description	Price
FMSPI007	Spirit 560SP External 56k Fax/Modem SVD	$195
FMSPI006	Int. 56K,SVD, Spk Ph.	$Call

Multimedia

$145
MMSPI000

Spirit TV Video Card

Turn your PC into a TV. PCI card that brings full TV reception capabilities to your PC. Features full motion video and "still" capture.

Networking

Spirit networking includes a full compliment of NICs and Hubs in 10, 100 and 10/100 configurations.

5 Port Hub NWSPI003 **$99**
PCI Network Cards NWSPI002 **$55**
ISA Network Card NWSPI001 **$39**
10/100 PCI NIC NWSPI001 **$125**

MODEMS

US Robotics®

56K Global Modem PC Card

This innovative 56 Kbps Global PC Card modem is easily configured for use worldwide and features x2 technology for high-speed downloads over standard phone lines.

Connect easily to phone lines with the included cable connector. Insert your cable into the modem & then when travelling attach an adaptor for the country you are visiting; plug into a phone jack & you're ready to fax or access data from anywhere in the world.

Features:

- Real-time access and 56 Kbps downloads - faster than 28.8Kbps modems
- x2 Technology: Faster downloads with higher throughput
- World Ready: Access in more than 250 countries/regions
- Flash DSP
- Flash ROM
- Guaranteed Compatibility
- Intelligent Auto Install: Easy installation in minutes

$365
FMROB009

56K Voice Faxmodem

The world's undisputed leader in high speed modems. Internet access couldn't be faster or easier with your "V.90 Technology" Faxmodem.

The new U.S Robotics Faxmodem in corporates the new ITU V.90 standard in addition to the existing x2 Technology allowing you to download from the internet at up to 56Kbps. It's also fully compatible with other modems from 33.6Kbps down to 300bps.

Features:

- New ITU V.90 Technology
- Download at up to 56K from the Interne
- Send and receive faxes directly from your PC
- Voice mail and Speaker phone support
- Easy installation
- Limited lifetime warranty

$245
FMROB006

Courier Modem

Dual Standard V.34 Fax with V.32 bis. Courier is compatible with all popular protocols and ITU-T standards.

It automatically detects and connects at the fastest available speed. Fast Faxing is achieved: V.17 at 14.4 Kbps, Group III, Class I & 2.0 with call detection.

Features:

- Flash ROM Upgradable: Designed with extra processing power-new software available from the US Robotics bulletin board service
- QuickConnect™: Completes handshake and begins transmission within 7 seconds
- Dial and Link Security with Dialback: Verifies authorised callers and modems

$479
FMROB005

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Adelong Computers

SYQUEST STORAGE

SparQ 1.0GB Drive

'The personal solution'.
A superb combination of high performance at an affordable price. Easily backup your laptop or desktop system in minutes. **SparQ** gives you the bandwidth you need for show-stopping multimedia presentations and archive your Internet downloads. Play your favourite games off a **SparQ** cartridge at twice the speed of a CD. Backup your computer in minutes. Transfer files, applications and operating systems from home to office for extreme flexibility and multitasking.

Features:
- 1.0 GB Capacity
- Buffer/Cache: 512 KBytes
- High Performance Hard Drive

Bonus Software Incl:
- Seagasoft Heat Net
- Novastor Novadisk SE
- Serif Drawplus 3.0 SE
- Netresults WEBVCR
- Alta Vista Howdy
- SPRYNET
- Mcaffee Webscan

$509

Code	Model	Price
BUSYQ004	SPARQ 1.0GB EIDE INT	$509
BUSYQ005	SPARQ 1.0GB PARALLEL EXT	$509
BUSYQ009	SPARQ 1.0GB MEDIA PC	$95

SyJet 1.5GB Drive

'The personal solution'.
Award-winning high performance removable cartridge hard drive. Enough capacity to hold over 1,000 floppies on a 3oz. cartridge. The logical choice for professional musicians, audio mixers, digital video editors, graphic designers, webmasters, desktop publishers and game players. Fast enough to store, edit and run full-motion video. Holds more than 80 minutes of broadcast quality video. Record, edit and run your audio compositions for seamless playback. Holds over 2 hours of CD-quality audio. Create animation, audio and video sequences for multimedia presentations. Run directly off a **SyJet** cartridge. Work directly from **SyJet** and minimise clutter on your internal drives.

Features:
- 1.5 GB Capacity
- Buffer/Cache: 512 KBytes
- High Performance Hard Drive
- Ground breaking technology
- Portable drive/light weight
- High speed, high volume

$709

Code	Model	Price
BUSYQ000	SYJET 1.5GB IDE INT	$709
BUSYQ001	SYJET 1.5GB SCSI EXT	$709
BUSYQ002	SYJET 1.5GB SCSI INT	$709
BUSYQ003	SYJET 1.5GB PARALLEL EXT	$709
BUSYQ008	SYJET 1.5GB MEDIA PC	$179

EZFlyer™ 230 Drive

The **EZFlyer™ 230** combines the flexibility of a data cartridge with the speed of hard drive technology. Easy-to-use, small and lightweight, the drive can be carried around in your pocket.The **EZFlyer™ 230** provides more space just by adding more cartridges. Carry large graphics files in the palm of your hand. Excellent storage device for desktop publishing, pre-press, Internet, photography, multimedia, imaging, video, audio and back-ups. The **EZFlyer™ 230** features external SCSI and Parallel Port.

Features:
- 230 MB Cap., Int.EIDE
- 13.5 msec average seek time
- External SCSI & Parallel Port
- Superior HD performance
- Small and lightweight
- Auto eject button

$375

Code	Model	Price
BUSYQ006	EZFLYER 230MB SCSI EXT	$375
BUSYQ007	EZFLYER 230MB PARALLEL EXT	$375
BUSYQ010	EZFLYER 230MB MEDIA PC	$75

State-of-the-art technology for MAC & PC file storage!

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IOMEGA

Jaz 2 Drive

Want portability and blistering speed?

The new format Jaz disks hold up to 2GB of data each. Jaz 2GB drives are 100% compatible with 1GB disks. Works with both MACs and PCs via an external SCSI interface.

JAZ 2GB DRIVE (SCSI EXT.) **$875** BUIOM018

JAZ 2GB DRIVE (SCSI INT.) **$875** BUIOM017

Jaz 1GB

Code	Model	Price
BUIOM004	JAZ DRIVE (SCSI INT.) – 1.0GB	**$560**
BUIOM003	JAZ DRIVE (SCSI EXT.) – 1.0GB	**$595**

Iomega Buz

All the hardware and software you need to be a video genius

Introducing the Iomega Buz -the easiest way to get multimedia from camcorders, DVD, CD-Roms, VCRs and laserdiscs into your PC! It's a video capture and editing board combined with an Ultra SCSI controller that lets you:

- Capture Multimedia (fullmotion) video, sounds, digital pictures, music) into a PC
- Edit it using the easiest software around

$375 BUIOM023

Zip Plus

One drive fits all

$359 BUIOM011

New AutoDetect technology connects the ZipPlus drive to either SCSI or parallel ports, and works on either PC or Macintosh computers. Bundled with Zip tools and a new range of HOT multimedia software titles.

- ImageAXS
- Recordit
- Webbuddy
- Netcard
- Adobe photodeluxe

Zip Drive

Expand your hard drive without limits

Heading Increase your storage quickly, easily and economically - as you need it. With 100MB Zip disks you can add as many disks as you need. Avaliable in three types. Parallel / SCSI Mode / ATAPI

100MB ZIP INT IDE **$195** BUIOM007

ZIP DRIVE EXT. SCSI -100MB **$255** BUIOM001

ZIP DRIVE EXT. PARALLEL -100MB **$255** BUIOM000

Zip Card

PCMCIA to SCSI adapter. Zip card is a PCMCIA to SCSI adapter card that, when connected to your notebook compuer and a SCSI Zip Drive, allows you to get 2-5 times the performance over a parallel port Zip Model.

$195 BUIOM022

...the fastest and most convenient way to run a zip drive on your notebook

Jaz Traveller

Portability Solution...

Jaz Traveller is a SCSI to parallel port converter for the Jaz drive. The Jaz Traveller allows you to connect an external Jaz drive to the parallel port on the IBM-compatible computers.

$95 BUIOM013

Media Accessories

Code	Model	Price
BUIOM012	100MB PC ZIP DISKS (1 PER PACK)	**$25**
BUIOM005	100MB PC ZIP DISKS (3 PER PACK)	**$72**
BUIOM006	100MB PC ZIP DISKS (10 PER PACK)	**$225**
BUIOM014	ZIP DRIVE CARRY CASE	**$25**
BUIOM020	JAZ MEDIA 1GB PC DISK (1 PER PACK)	**$185**
BUIOM008	JAZ MEDIA 1GB PC DISKS (3 PER PACK)	**$530**
BUIOM024	JAZ MEDIA 2GB PC DISK (1 PER PACK)	**$205**
BUIOM025	JAZ MEDIA 2GB PC DISKS (3 PER PACK)	**$595**

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ALTEC LANSING

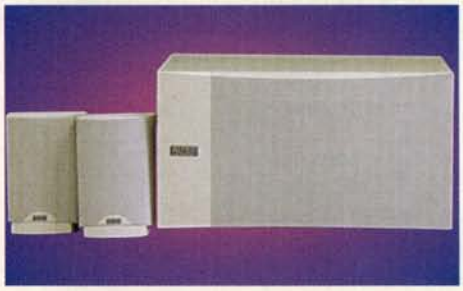
SPEAKERS

January 1998

PC MAGAZINE AUSTRALIA EDITORS' CHOICE

ACS48 PowerCube Plus Speaker System

The PowerCube Speaker System, from Altec Lansing is the market's leading affordable audiophile multimedia audio solution for the home or office. Comprising of a 3 unit system, allows you to experience hi-fi quality audio from your CDs, games or the Internet. In addition, the Powercube Plus 6" subwoofer is encased in wood, offering you a deeper low frequency response.



- 20 Watts RMS Satellite Speakers
- 3" full range driver
- 3/4" high frequency driver
- 40 Watts RMS, 6" subwoofer
- frequency response 35Hz - 20 Khz

$290
MMALT003

ACS45 PowerCube Speaker System

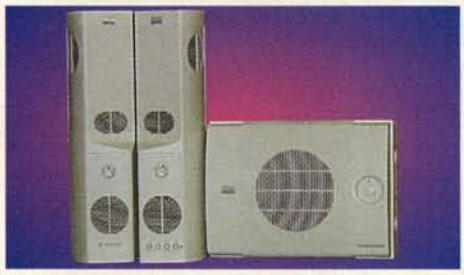
Introducing the Altec Lansing ACS45 PowerCube Speakers, a three piece multimedia audio solution at an unbelievable price. Experience the enhanced output of the PowerCube satellite system . Great for games and CD's, the ACS45 will bring hi-fi audio to your computer desktop today.

- 6 Watts RMS Satellite Speakers
- 3" full range driver
- 20 Watts RMS, 4.5" subwoofer
- frequency response 35Hz - 20 Khz

$180
MMALT001

ACS500 Surround Sound Speaker System

This superb three piece system delivers five channels of surround sound featuring Dolby Pro-Logic for Multidimensional excitement. The Satellite tower speakers deliver direct stereo imaging for hi-fi audiophile sound whilst giving the option for center and surround channel effects & sounds.



- 22.5 Watts RMS Satellite Speakers
- 2 x 3" full midrange driver
- 1/2" dome tweeter
- 40 Watts RMS, 6.5" subwoofer
- frequency response 35Hz - 20 Khz

$450
MMALT004

ACS55 Power Gaming Speaker System

A Three-piece speaker system that delivers the realistic sound demands of today's games. Combing a powerful 40Watt subwoofer and a unique satellite speaker which incorporates direct stereo imaging through center and surround channels. In addition the ACS55 features Dolby (r) Multimedia Surround Sound for Multidimensional Effects.

- 12 Watts RMS Satellite Speakers
- 3" full range driver
- 1/2" dome tweeter
- 40 Watts RMS, 6.5" subwoofer
- frequency response 35Hz - 20 Khz

$290
MMALT002

ACS91 Altec Lansing

The ACS91 PowerCube speaker system delivers powerful audio output to suit the home or office computer. Mainting the tradition of audio quality synonymous with Altec Lansing these speakers are now available at an unbelievable price.

- 5 Watts RMS Satellite Speakers
- 3" full range driver
- frequency response 90Hz - 20 Khz

$69
MMALT000

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DATA SWITCHES, NETWORK & CASES

CPU Switch

CS-102/104/106/128

These CPU switches are useful **for operating 2 to 8 computers from one keyboard,** mouse and monitor. Ideal for administrators & those with more than 1 computer. Switching is done via an electronic button.

Code	Model	Price
DSADE030	**CS-102**	**$245**
DSADE037	**CS-122** Same as 102 with PS/2 support	**$275**
DSADE019	**CS-104** 4-port CPU Switch with PS/2 AT mouse and keyboard support	**$395**
DSADE020	**CS-106** 6-port CPU Switch with AT mouse and keyboard support	**$399**

CS-102

CS-104

CS-106

Cable Sets

Code	Model	Price
CBGEN098	AT Cable Set (KeyBd.M/M, Mouse M/F & Monitor M/F)	**$35**
CBGEN099*	PS/2 Cable Set (KeyBd.M/M, Mouse M/M & Monitor 5M/15F)	**$39**

Code	Model	Price
DSADE036	**CS-128** 8-port CPU Switch with both PS/2 and AT mouse/keyboard support *Requires special cables	**$695**

CS-128

Code	Model	Price
CBGEN127	AT Cable for CS-128	**$39**
CBGEN128	PS/2 Cable for CS-128	**$39**

Video Splitter

VS-102/104/108

Cascade ability allows infinite no. of VGA monitors to display the same image. Cable Required; 15pin M/15pin F

Code	Model		Price
DSADE000	**VS-102**	2-port Video Splitter	**$95**
DSADE001	**VS-104**	4-port Video Splitter	**$135**
DSADE002	**VS-108**	8-port Video Splitte	**$195**

Printer Switch

Printer switch. 1 computer to connect to multiple printers.

Code	Model	Price
DSADE007	**4 Way Printer Switch**	**$39**
DSADE021	**2 Way Printer Switch**	**$25**

Power Supplies

Code	Model	Price
PSGEN000	200W POWER SUPPLY	**$35**
PSGEN002	200W ATX POWER	**$55**
PSGEN003	300W ATX POWER	**$99**

UPS Power Supplies

Code	Model	Price
PSAPC000	APC BACK-UPS 500	**$325**
PSAPC001	APC BACK-UPS PRO 420	**$439**
PSAPC002	APC BACK-UPS PRO 650	**$645**
PSAPC003	APC SMART-UPS 700	**$890**

Keyboards

Code	Mode	Price
IOGEN000	ENHANCED 104/WIN95	**$25**
IOGEN001	HONEYWELL GENUINE - 104/WIN95	**$45**
IOGEN010	GENERIC PS/2 Keyboard	**$35**

Mice

IOGEN004	GENERIC 3 BUTTON MOUSE	**$10**
IOMST003	MICROSOFT INTELLI-MOUSE	**$90**
IOMST004	GENIUS 3 BUTTON MOUSE - SER./PS2	**$25**

Networking

Code	Model	Price
NWGEN000	ISA Ethernet Card (COMBO)	**$29**
NWGEN001	PCI Ethernet Card (COMBO)	**$35**
NWGEN002	5 PORT HUB with up-link port	**$79**
NWGEN003	8 PORT HUB with up-link port	**$99**
NWGEN004	16 PORT HUB with up-link port	**$225**
NWGEN005	PCMCIA Ethernet Combo	**$139**

SCSI Controllers

Code	Model	Tfr Rate	Price
CCGEN001	AHA-1520	10 Mbs	**$155**
CCGEN005	AHA-2940UW	40 Mbs	**$395**
CCGEN006	AHA-2940UWK	40 Mbs	**$620**
CCGEN011	AHA1460	20 Mbs	**$375**

Controller Cards

Code	Model	Price
CCGEN000	ISA MULTI I/O	**$35**
CCGEN015	ISA PRINT CARD	**$20**

Cases

ADE FILE SERVER CASE AT/ATX
- 2 x 300W Redundant Power Supplies
- 7 x 5 1/4" & 2 x 3 1/2" Bays

CAADE013 **$975**

ADE DELUXE AT/ATX MID CASE
W: 192mm
D: 430mm
H: 540mm
CAADE004 **$155**

ADE DELUXE AT/ATX MID CASE
W: 190mm
D: 425mm
H: 475mm
CAADE009 **$135**

ADE DELUXE AT/ATX DESKTOP CASE
W: 442mm
D: 473mm
H: 155mm
CAADE012 **$135**

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NETGEAR NETWORKING

PRINT SERVER

NETGEAR print servers enable you to connect printers to the network for sharing among multiple PCs.

PS104 10Mbps Print Server

Ideal for a small network, the PS104 caters for 1 parallel printer. In addition the PS104 sports a built in 4 port ethernet hub to save space and costs.
NWNGR000 **$369**

PS110 10/100Mbps Print Server

Perfect for the office environment, the PS110 connects to 2 parallel printers to a 10 or 100 Mbps hub/switch, providing effortless transition from Ethernet to Fast Ethernet. NWNGR001 **$479**

10/100 Mbps Dual Speed Hubs

NETGEAR dual speed hubs allows users to mix and match 10 and 100Mbps PCs, servers and peripherals on the same network with ease and without the high cost and complexity of multiple hubs and switches.

Netgear DS108

The NETGEAR DS108 provides 8 autosensing dual speed ports to connect 8 PC's at 10 or 100 Mpbs making network speed upgrades easy and effortless.

NWNGR015

Code	Description	Price
NWNGR015	DS108 8 Port Dual speed hub	**$699**
NWNGR008	DS508 8 Port Dual speed hub - Stackable	**$1049**
NWNGR009	DS516 16 Port Dual speed hub - Stackable	**$1849**
NWNGR014	DS524 24 Port Dual speed hub - Stackable	**$2399**

10Mbps Ethernet Hubs

NETGEAR hubs are designed to integrate supreme performance and reliability whilst being easy to use. All hubs are provided with an uplink port for future network expansion capabilities.

CODE	Description		Price
NWNGR005	EN108TP	8 Port Hub with 10Base-T support	**$135**
NWNGR002	EN104TP	4 Port Hub with 10Base-T support	**$95**
NWNGR003	EN104	4 Port Hub with 10Base-T, AUI and BNC support	**$125**
NWNGR004	EN106TP	6 Port Hub with 10Base-T support	**$120**
NWNGR006	EN108	8 Port Hub with 10Base-T, AUI and BNC support	**$175**
NWNGR007	EN116	16 Port Hub with 10Base-T, AUI and BNC support	**$299**
NWNGR012	EN516	16 Port Rack Mountable Hub	**$399**
NWNGR013	EN524	24 Port Rack Mountable Hub	**$510**

Network Cards

The NETGEAR FA310TX is an autosensing 10/100mbps Ethernet PCI adapter designed to support the next generation of network applications.
NWNGR010 **$84**

LIFE TIME WARRANTY

The NETGEAR FA410TX is 10/100Mbps PCMCIA Ethernet card. With the FA410TX your laptop is compatible with 10Mbps Ethernet with built in migration to 100Mbps Fast Ethernet; all for a 10Mbps price.
NWNGR011 **$285**

TOLL FREE SUPPORT 7 DAY / 24 HOURS with Netgear products

Bay Networks

D-Link NETWORKING

DFE-530TX PCI-bus 10/100M fast Ethernet network interface card

Intelligent Ethernet/Fast Ethernet adaptor, Auto negotiating 10Base-T/100Base-TX, Plug and Play support, low CPU utilisation, 32 bit high performance bus master, Optional remote boot rom, Certified driver for Netware, SCO Unix, Windows 95 and Windows NT.

$59
NWDLI016

DE-660CT PC Card Ethernet network interface card with RJ-45/BNC connectors, JITI function supported

PCMCIA card with RJ-45 & BNC connectors, Full plug and play, Autodetection of cable type, Supports full duplex, Netware, SCO Unix, Windows 95 and Windows NT compatible, Support D-link just-in-time-interrupt (JITI) technology, 30% faster than other standard PCMCIA card.

$125
NWDLI003

DE-905/N Ethernet Network Kit (5-port Ethernet Hub & 2 ISA-bus Ethernet card)

Network kit for SOHO user, Easy to install, includes two Cat-5, 20 feet cables and AC power adaptor for hub, simple plug-and-play installation, D-link hubby received CeBit 95 Highlight Award.

$205
NWDLI006

DES-1008/N 8-port Ethernet/Fast Ethernet Switch with 8x N-Way UTP ports

8 port UTP Auto negotiating 10/100Mbit switch (N-Way), Supports UTP/STP cables, MDI-II port, Support full/half duplex, Provides cut-through and fast store & forward switching, Auto polarity correction, Dynamic buffer allocation for network load balancing, Desktop size.

$1695
NWDLI014

Code	Model	Description	Price
NWDLI000	DE-220PCT	ISA Bus PnP Ethernet Adaptor with RJ-45/BNC Connectors	**$35**
NWDLI001	DE-528CT	PCI-bus Ethernet adaptor with RJ-45/BNC connectors	**$50**
NWDLI004	DE-809TC/N	8-port 10Base-T Ethernet Unmanaged Hub with BNC support	**$159**
NWDLI005	DE-816TP/N	16-port 10Base-T Ethernet Unmanaged Hub with 1 AUI &1 BNC ports (Rack-mount)	**$350**
NWDLI011	DES-810	8-port Switch hub, 8x10 BASE-T, 2x100 NWay ports, UTP/STP supported	**$899**
NWDLI013	DFE-650TX	Fast Ethernet 10/100MB dual speed NWay PCMCIA card	**$245**
NWDLI012	DFE-908X	8 Port 10/100MB dual speed Hub with switching	**$896**
NWDLI014	DFE-916X	16 Port 10/100MB dual speed Hub with switching	**$1339**
NWDLI015	DP-300	10/100MB dual speed Fast Ethernet Multiprotocol print server	**$559**

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TRENDnet... High Quality, Cost Effective Networking

TE100-H16s 16-port 100Base-TX Stackable Ethernet Hub (19" Rack Mount)

This model provides an exceptional opportunity for expansion.

TE100-H8E/H5E 8-port/5-port 100Base-TX Mini Hub

An additional uplink port is built into the hub to permit easy expansion, while extensive front-panel LED's provide instant trouble shooting capabilities.

TE100-H8s 8-port 100Base-TX Stackable Ethernet Hub (19" Rack Mount)

By stacking a total of 6 hubs together and by linking 2 stacks raises the total number of supported ports to 94.

TRENDnet Low-Cost True Dual Speed Hubs

TTRENDnet has introduced two **new** dual speed switchable hubs, the **TE100-DX8** and the **TE100-DX16.**

- These are 8 and 16 port (respectively) true dual-speed 10/100Mbps switching hubs that provide a new level of flexibility and easy migration between bandwidth. Each port supports auto sensing between 10Mbps Ethernet and 100Mbps Fast Ethernet.
- The TE100-DX8 and the TE100-DX16 are inter-stackable up to 5 hubs. With their built-in switch modules, these hubs are true 10/100Mbps interpretability.
- These hubs feature plug and play installation with auto-port configuration, scalable and stackable expansion capabilities, plus auto sensing and auto-negotiation. Backed by a lifetime warranty and competitive pricing.

*** Life time warranty**

Code	Description	Inc
Software configurable ISA Adapters		
NWTRE000	S/ware Configurable 16-bit ISA Ethernet Combo Card (TP & BNC)	$33
TE-16PnP Series	**Plug-n-Play ISA Adapters**	
NWTRE001	PnP 16 bit ISA Ethernet Card (TP)	$33
NWTRE002	PnP 16-bit ISA Ethernet Combo Card (TP & BNC)	$38
TE-PCI Series	**High-Performance PCI Adapters**	
NWTRE003	PnP 32-bit PCI Ethernet Card (TP & BNC)	$41
NWTRE004	Plug-n-play 32-bit Ethernet Card (TP & BNC), Digital Chipset	$70
PCMCIA & Pocket Adaptors		
NWTRE005	10Mbps PCMCIA Ethernet Combo Card (TP & BNC)	$105
NWTRE006	10/100 Mbps PCMCIA Ethernet Card	$225
10Base-T Unmanaged Hubs		
NWTRE007	5 RJ-45 ports Ethernet Mini Hub	$83
NWTRE008	8 RJ-45 ports Ethernet Mini Hub	$98
NWTRE009	9 RJ-45 ports Ethernet Mini Hub	$144
NWTRE010	8 RJ-45 & 1 BNC ports Ethernet Mini Hub	$124
NWTRE011	16 RJ-45, 1 BND & 1 AUI port 10 Bsae-T Ethernet Hub	$285
NWTRE012	24 RJ-45, 1 BNC & 1 AUI port 10 Base-T Ethernet Hub	$478
10/100 Mbps Fast Ethernet Adapters		
NWTRE013	10/100 Mbps Fast EtherNet Adapter for PCI/Digital Chipset	$90
100 Mbps Fast Ethernet Hubs		
NWTRE014	5 port 100Base-TX Mini Hub/External power adapter	$198
NWTRE015	8 port 100Base-TX Mini Hub/External power adapter	$341
NWTRE016	8 port 100Base-TX Stackable Ethernet Hub	$521
NWTRE017	16 port 100BseTX- Stackable Ethernet Hub	$979
10/100 Mbps Dual Speed Hubs		
NWTRE018	16-Port 10/100 MBPS Stackable Dual Speed Hub	$1,080
NWTRE020	24-Port 10/100 MBPS Stackable Dual Speed Hub	$1,660
NWTRE021	8-Port 10/100 MBPS Stackable Dual Speed Switching Hub	$600
NWTRE022	16-Port 10/100 MBPS Stackable Dual Speed Switching Hub	$1,145
10/100 Mbps Switching Hubs		
NWTRE023	2 port (1 100Mbps + 1 10/100 Mbps) Switching Hub	$514
NWTRE024	2 port (1 RJ-45, 1 SC-type fiber) Switching/Fiber Converter	$680
NWTRE025	10-port (2 100Mbps + 8 10Mbps) Switch	$1,070
NWTRE026	8 port (8 10/100Mbps) N-Way Switch	$1,670
NWTRE027	12 port (12 10/100Mbps) N-Way Switch	$2,430
Print Servers		
NWTRE028	EtherPort Print Server for Novell, TCP/IP, Win95/NT (2P + 1 S)	$374
NWTRE029	EtherPort Jnr. Print Server for Novell, TCP/IP, Win95/NT (1P)	$300
NWTRE030	10/100 Mbps Multi-Protocol Print Server (1 Parallel)	$340
NWTRE031	10/100 Mbps Multi-Protocol Print Server (2P+1S)	$525

TE100-S21 2-port Switching Hub

Of its 2 RJ-45 connections, one has auto-sensing capabilities of 10/100Mbps while the other has dedicated usage for 100Mbps technology. It may be used as a repeater for distance exceeding 100m.

TE100-S88 8-port N-way Switching Hub

Its auto-sensing technology enables information to be forwarded automatically by the switch without interfering with other segments. Its uplink port provides easy cascading to another switch, hub or repeater.

TE100-S28 10-port Switching Hub

The TE100-S28 is great for systems that have integrated 10Base-T and 100Base-TX products. This switching hub has 8 10Mbps twisted-pair ports and 2 100Mbps twisted-pair ports.

TE100-PC16 10/100Mbps PCMCIA Ethernet Card

With the TE100-PC16, laptop users can hook up their laptops to 10Mbps or 100Mbps LAN. This Ethernet Card can support a full-duplex mode increasing the data transfer rate to 200Mbps.

TE100-PCI 10/100Mbps Fast Etherne Adapter for PCI (digital chipset)

Utilising high-speed 100Base-TX technology and transmitting data over the Ethernet network at 10Mbps or 100Mbps, the TE100-PCI can operate in half/fullduplex modes thus doubling the network bandwidth to 20 or 200Mbps. The adapter runs in bus master mode by directly sending and receiving Ethernet packets while using minimal aid from the CPU.

TE100-PS3 10/100Mbps Multi-protocol PRINT SERVER

This Fast Ethernet multi-protocol print server is equipped with auto-sensing 10/100Mbps N-way interface. With 2 high-speed parallel ports and 1 serial port, this print server can connect with as many as 3 printers while simultaneously eliminating bottlenecks.

SOLID INTERNATIONAL USER-BASE

TRENDnet is proud to have an installed base with the following companies:

- American Airlines
- American Express
- AT&T
- Compaq Computers
- Computerland
- Dun & Bradstreet
- Epson America
- Gateway USA
- Honeywell, Ltd., Canada
- IBM
- Lotus Development
- Motorola
- Samaung Electronics
- Sun Micosystems
- Symantec
- Toshiba, Japan
- University of Arizona
- University of Colorado
- Xerox, Canada

TRENDnet®
We are the Trend for Fast Ethernet

Our commitment to performance, service, and quality have given us the opportunity to work with industry leaders. We stand by the companies that we serve.
*on selected products

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 9700 9354

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HEWLETT PACKARD EPSON

PRINTERS

HP 695C

Inexpencive and simple to use, the HP DeaskJest 695C printer produces affordable, high-quality colour and black printing - perfect for schoolwork, personal finances, letters and hobbies.

$339 PRHPD039

HP 720C

- PhotoREt II delivers ***smaller ink drops & more colour shades***
- The HP Deskjet 720C is designed for Microsoft® Windows® 3.1x, Windows 95 and Windows® NT 4.0 OS & supports Intel's MMX technology for faster colour processing
- Prints fast - up to 8 pages per minute.

$575 PRHPD031

HP 6L

- ***Compact size***
- 600dpi RET
- Up to (6ppm) makes the HP 6L the ideal printer for the home or small office

$660 PRHPD009

CALL FOR A WIDE RANGE OF HP SCANNERS

Code	Model	Price
PRHPD000	DeskJet 340	$495
PRHPD002	DeskJet 670C	$255
PRHPD025	DeskJet 890C	$795
PRHPD035	OfficeJet Pro 1170C	$1450
PRHPD034	LaserJet 3100	$1395
PRHPD010	LaserJet 6P	$1399
PRHPD040	DeskJet 710C	$Call

STYLUS COL. 640

$365 PREPS019

1440X720 DPI, 3PPM, WIN COMP. With its remarkable 1440 x 720 dpi capability, the Epson Stylus COLOR 640 sets a new standard for cost-efficinet, photo-quality colour printing without the need for expensive options.

STYLUS COL. 740

$535 PREPS021

1440X720 DPI, 7PPM
The new Epson Stylus COLOR 740 is targeted at business/ corporate and professional graphics users. It includes speeds which eclipse many desktop laser printers as well as an amazing photo-quality resolution of 1440 by 720 dpi.

STYLUS PHOTO EX.

$845 PREPS015

The Epson Stylus Photo EX is the perfect printer for photo reproduction, pre-proof graphics. Industry-leading 1440dpi resolution with a six-colour ink system and A3 paper handling.

Code	Model	Price
PREPS001	Stylus Col. 440	$270
PREPS011	Stylus Photo 700	$445
PREPS016	Stylus Col. 850	$745
PREPS010	Stylus Col. 1520	$1595

INK & TONER CARTRIDGES

Canon

Code	Description	Printer compatibility	Price
INCAN000	BC01 BLACK	BJ10/20	$45
INCAN001	BC02 BLACK	BJ200/BJ210/BJ240	$45
INCAN002	BC05 COLOUR	BJ210/240	$49
INCAN003	BC06 PHOTO COLOUR	BJ240	$49
INCAN004	BC06 PHOTO COLOUR KIT	BJ240	$65
INCAN005	BC09F FLURO COLOUR	BJ210/BJ240	$79
INCAN006	BC10 BLACK & HEAD	BJ30/BJ70	$55
INCAN007	BCI-10 BLACK	BJ30/70	$25
INCAN008	BC11 COLOUR & HEAD	BJ70	$65
INCAN009	BCI-11 BLACK (3 PK)	BJ70	$25
INCAN010	BCI-11C COLOUR (3 PK)	BJ70	$35
INCAN011	BC20 BLACK & HEAD	BJ4000 SERIES	$49
INCAN012	BC21 COLOUR & BLACK	BJ4000 SERIES	$79
INCAN013	BCI21 BLACK	BJ4000 SERIES	$14
INCAN014	BCI21C TRI-COLOUR	BJ4000 SERIES	$29
INCAN015	BC22 PHOTO	BJ4200/BJ4500	$75
INCAN016	BC22 PHOTO KIT	BJ4200/BJ4500	$95
INCAN017	BC29F FLURO COLOUR	BJ4000 SERIES	$75
INCAN018	BJI201B BLACK	BJ600 SERIES	$25
INCAN019	BJI201C CYAN	BJ600 SERIES	$15.50
INCAN020	BJI201M MAGENTA	BJ600 SERIES	$15.50
INCAN021	BJI201Y YELLOW	BJ600 SERIES	$15.50
INCAN022	BJI642 BLACK	BJ300/330	$29
INCAN023	BJI643 BLACK	BJ800/880	$45
INCAN024	BJI643C CYAN	BJ800/880	$49
INCAN025	BJI643M MAGENTA	BJ800/880	$49
INCAN026	BJI643Y YELLOW	BJ800/880	$49
INCAN027	BJI801 BLACK	BJ80	$39
INCAN028	BC03 BLACK	BJ210SP	$45
INCAN029	BC60 BLACK	BJC7000	$59
INCAN030	BC61 COLOUR	BJC7000	$69
INCAN031	BC62 PHOTO COLOUR	BJC7000	$95

HEWLETT PACKARD

Code	Description	Printer compatibility	Price
INHPD000	HP51633M BLACK	HP PORTABLE	$49
INHPD001	HP51626A BLACK	HP 500 SERIES	$49
INHPD002	HP51629A BLACK	HP 600 SERIES	$55
INHPD003	HP51645A BLACK	HP850C/1600	$50
INHPD004	HP51640A BLACK	DJ 1200 SERIES	$50
INHPD005	HP51606A BLACK	HP PAINTJET XL	$55
INHPD006	HP51639A BLACK	PAINTJET XL300	$39
INHPD007	HP51625A COLOUR	DJ500 SERIES	$49
INHPD008	HP51649A COLOUR	HP 600 SERIES	$55
INHPD009	HP51641A COLOUR	HP850C	$55
INHPD010	HP51640C CYAN	DJ1200/1600	$55
INHPD011	HP51640M MAGENTA	DJ1200/1600	$55
INHPD012	HP51640Y YELLOW	DJ1200/1600	$55
INHPD013	HP COLOUR PHOTO KIT	HP690C	$79
INHPD014	HP 16A PHOTO INK	HP690/692/693	$59
INHPD022	HPC1823A COLOUR	HP720/890/1120	$59

EPSON

Code	Description	Printer compatibility	Price
INEPS003	SO20025 BLACK	400/800/1000	$35
INEPS004	SO20034 BLACK	COLOUR/PRO/PROXL	$45
INEPS005	SO20036 COLOUR	COLOUR/PRO/PROXL	$85
INEPS006	SO20047 BLACK	200/820/II/IIS	$35
INEPS007	SO20049 COLOUR	II/IIS/820/1500	$45
INEPS008	SO20062 BLACK	STYLUS 1500	$65
INEPS009	SO20066 COLOUR	STYLUS PRO XL+	$95
INEPS010	SO20089 COLOUR	400/600/800/1520	$45
INEPS011	SO20093 BLACK	C400/500/600	$35
INEPS012	SO20097 COLOUR	C500/200	$49
INEPS013	SO20108 BLACK	C800/1520	$45
INEPS014	SO20110 PHOTOCOLOUR	PHOTO 700/EX	$45

Toner Cartridge

Code	Description	Printer compatibility	Price
TOHPD000	HP92295A	HP LASERJET II/III	$135
TOHPD001	HP92274A	HP 4L/4ML/4P/4MP	$125
TOHPD002	HP-C3906A	HP LASERJET 5L/6L	$105
TOHPD003	HP92275A	HP IIP/IIIP/IIIP+	$149
TOHPD004	HP92291A	HP 4SI/4SI MX/3SI	$220
TOHPD005	HP-C3900A	HP 5SI/5SI MX	$325
TOHPD006	HP92298Z	HP 4/4M/5/5N/5M	$165
TOHPD007	HP-C3900A	HP 4V/4MV	$275
TOHPD008	HP	HP 5P/5MP/6P/6MP	$145

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BJC-50 PRCANO20 $598

- Half the size of the BJC-80 but not half the performance.
- Featuring a InfraRed Port and Lithiumlon Battery which is good for 100 A4 prints.
- Maximum resolution of 720dpi at up to 5.5ppm
- Snap in the optional scanner head for 360dpi full colour scanning.

BJC-80 PRCAN000 $349

- Drop Modulation Technology - the dual drop size breakthrough that ***produces smoother colour gradations.***
- Office laser quality finish & B&W speeds up to 5 pages per min. with dedicated black cartridge.
- Windows® 95 compatible IrDA infrared port for cable-less communications.
- Fits in half a briefcase & only 1.4Kg!
- ***Optional scanner head for colour graphics, OCR & faxing.***

PRCAN001 **$149**

BJC-4310SP PRCAN022 $268

NEW IMPROVED SUPER ECONOMY MODE

- drop modulation technology uses dual drop sizes for smoother colour graduations with standard and photo realism inks.
- optional photorealism inks for photo gold standard printing.
- speed black cartridge prints up to 4.5 pages / minute.
- optional colour scanner for image acquisition , fax and copying functions (with appropriate software)
- plus banner printing and better internet printing.

BJC-255SP PRCAN017 $175

- Super Economy mode for colour and B&W.
- Photo Mode printing for colour that rivals more expensive four-colour systems.
- Prints up to 2400 B&W pages and 600 colour pages.
- New high capacity black cartridge 20% more ink, no extra cost.
- Up to 5 times the output of direct competitors.

BJ-4650 PRCAN016 $438

- A3 colour printing, ***perfect for CAD, DTP and spreadsheet work.***
- Supports black & various colour cartridge options.
- PhotoRealism option for photographic reproduction with richer, more life-like colours.

BJC-7000 PRCAN012 $438

- 7-colour ink system and 9 saturation levels per pixel for ***incredibly rich photographic half-tones.***
- Combined total of 1088 print nozzles firing up to 10,000 drops per second!
- P-POP (Plain Paper Optimised Printing) gives plain paper a coated paper quality finish.
- Documents printed with P-POP are 99.4% water fast!

MultiPass C20 PRCAN021 $675

Put a multi-talented colour printer to work for you. Not only is the MultiPass C20 one of the only multifunction printers with true ***photo-quality printing*** (with optional Photo Kit), but it also offers professional-quality copying, plan-paper Bubble Jet faxing and up to 400 dpi grayscale scanning. The MultiPass C20 gives your home office the power of a big company.

FB320P IOCAN002 $210

All the advanced technology of the 620P at 300 dpi

FB620P IOCAN003 $275

It takes up less desktop real estate than any other colour flatbed scanner on the planet yet still ***delivers exceptional 600 dpi scanning performance-ideal for businesses*** with a variety of scanning needs.

- New Contact Image Sensor technology
- Optical Resolution 600 dpi
- Maximum Resolution 2400 dpi x 2400dpi
- 30 bit Colour

SPEAKERS

Juster brings you the true sound from Multimedia Speaker Systems!

3D-128 Subwoofer

1 x Subwoofer + 2 x Satellites
- Power output (PMPO): 800W
- Volume, Bass, Controls
- Power on/off LED
- Earphone output jack
- Frequency response: Subwoofer: 40-150 Hz Satellite: 150-20K Hz

$125 MMJUS001

3D-103 Subwoofer

1 x Subwoofer + 2 x Satellites
- Power output (PMPO): 500W
- Volume, Bass, Controls
- Power on/off LED
- Earphone output jack
- Frequency response: Subwoofer: 20-300 Hz Satellite: 150-20K Hz

$80 MMJUS000

SP-650 Surround Sound

- Power output (PMPO): 480W
- Volume, Bass, Treble 3D Controls
- Power on/off LED
- Earphone output jack
- Frequency response: 40-20K Hz

$60 MMJUS002

AC-691N Speakers

- Power output (PMPO): 120W
- Volume Controls
- Power on/off LED
- Earphone output jack
- Frequency response: Subwoofer: 80-20K Hz

$17 MMJUS003

POWERQUEST

DriveCopy

Fortunately, now there's **DriveCopy** from PowerQuest. With a few simple steps, everything from your old hard drive is automatically copied to your new one without losing a single preference, setting, or byte of data. No re-installing, no data loss, no headaches. **DriveCopy** supports all of the popular operating systems and file systems they use.

SWPOW003 **$59**

Drive Image

Easy - A user-friendly interface makes it easy to manage your saved files. And a step-by-step wizard simplifies the backup process.

Fast - Drive Image can now create a compressed image of your hard drive up to eight times faster than before. Plus, with its patent-pending SmartSector™ technology, Drive Image can copy significantly faster than traditional backup methods.

Safe - Drive Image now features ImageShield™ password protection and encryption to protect critical information.

Flexible - You can quickly restore your whole hard drive or recover individually selected files. Drive Image also allows you to "span" across removable media, such as Zip, JAZ, and SyQuest drives.

SWPOW002 **$110**

PartitionMagic

With **PowerQuest's PartitionMagic 3.0,** optimizing a hard drive without destroying data is as easy as clicking your mouse. Now even the novice computer users can visually create, format, shrink, expand and move hard disk partitions in minutes. NEW PQ Boot utility allows booting multiple OSs.Maintain system integrity by running different operating systems in different partitions. Recover up to hundreds of megabytes of hard disk space by resizing inefficient FAT clusters. Version 3.0 supports all major platforms, including DOS, Windows 3.1, Windows 95 NT, and OS/2.

- Intuitive Graphical User Interface.
- Shrink, expand and move FAT and HPFS partitions with the click of a mouse.
- NEW extensive file system diagnostics.

SWPOW001 **$105**

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CHECK2000

Greenwich Mean Time

Adelong Computers

Ensure that your software and hardware is ready for the millenium with CHECK 2000

CHECK2000 PC

$77

SWGRE000

Check2000 products suite detects the five "at risk" layers in PCs to help users and businesses fully understand the issues of the Millenium Bug. These five layers are:

1. Hardware BIOS
2. Operating System
3. Applications
4. User Data
5. Data Exchange & Communication

Check2000 PC address layers 1-3. Checks and corrects 98% of BIOS faults and analyzes the operating system and applications to determine which elements are at risk. Check2000PC also advises on how to resolve these issues.

Check2000 PC Deluxe addresses layers 1 - 4 hence catering for critical user data as, well as layers 1-3. All user data is analyzed including spreadsheets and databases to ensure that all individual fields and cells are reported. Check2000 PC Deluxe goes further into advising on how to correct these problems.

CHECK2000 PC Deluxe

$95 SWGRE001

CHECK2000 Client/Server

$425

SWGRE002

Check2000 Client/Server allows network-central deployment of the tools for checking all 5 layers and provides advise on correcting problems at each layer. Reports can be generated detailing where the millenium bug problems are, and hence allows for a structured and risk-based approach to resolving these issues.

Call for additional licenses

" DONT LET THE YEAR 2000 BUG AFFECT YOUR BUSINESS"

What is the Year 2000 or Millenium Bug?

The Year 2000 bug is a result of storing the year date as a 2 digit number instead of 4. Hence when we move into the Year 2000, the year date will click back to 00, causing an array of problems for hardware and software. However with Check2000 PC you can be alerted of your problems today, so that your business can be ridiculed of all bugs before its too late.

"CHECK2000 IS THE PRODUCT BY WHICH ALL OTHER YEAR 2000 TOOLS SHOULD BE MEASURED" Microsoft Web Site

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
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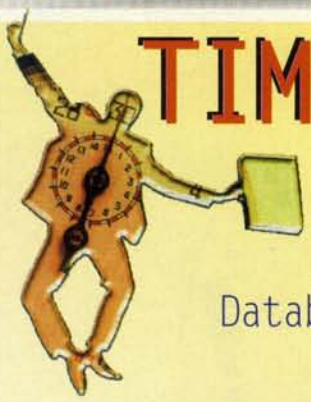
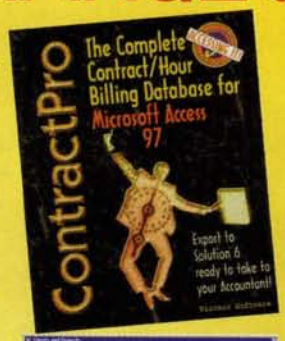


TIME TO TAKE CHARGE!

With ContractPro SWCON000 $395

A ready to Go Time- Billing Database For Microsoft Office Pro and Assess 97+



Change by the Hour? Then ContractPro is the Database solution for you! ContractPro has been specifically designed for business and individuals who change by the hour. It offers a full range of business features that will allow you to take charge of your business.

ContractPro is an easy to use Time Billing database that runs inside of MS Office/Access 97+. This gives ContractPro access to all of the power , compatibility and reliability of the Microsoft Environment. Unlike other accounting and business software available, you do not need to be an accounting genius to set up or use ContractPro. The software is intuitive and easy to use with help tips and online help available during program usage. Make life easier on yourself and get a ContractPro Today!

SOFTWARE

Microsoft

Code	Description	Price
SWMST070	Windows 98 CD New User	$275
SWMST069	Windows 98 Upgrade CD	$138
SWMST071	Microsoft Plus 98	$65

Microsoft Value Pack

Includes:
Microsoft Office Pro. u/g,
Encarta World Atlas,
Greeting Workshop,
Publisher 98,
Money 98,
Norton Anti-Virus,
Microsoft Intellimouse

Code	Description	Price
SWMST043	Microsoft Value Pack	$650

Code	Description	Price
SWMST007	Microsoft Office Pro Edition	$895
SWMST008	Microsoft Office Pro Edition Upgr.	$525
SWMST005	Microsoft Office Standard Edition	$755
SWMST006	Microsoft Office Standard Edition Upgr.	$419

Adobe

Code	Description	Price
SWADD002	Adobe Illustrator 7.0	$695
SWADD000	Adobe PageMaker 6.5	$1075
SWADD005	Adobe Acrobat 3.0	$335
SWADD006	Adobe Photoshop 5.0	$1095
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iCode	Description	Price
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SWMY003	Premier Accounting	$880

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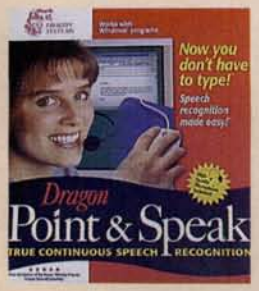

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Adelong Computers

Customer Service

Commonly asked questions

What do I do if my order is late in arriving?

Ring the Sales Representative with whom you have originally placed the order. Quote your order number or full name of the person or company who purchased the items. We first have to establish if the goods were sent out or not. If not, the product is temporarily out of stock and the up-to-date delivery time may be obtained from your sales representative. If the product has been sent out already, the problem will be with the carrier. You will then be transferred to the Dispatch Representative who will take your details, contact the carrier and then call you back.

What do I do if my product has been damaged during delivery?

If your product has been damaged, our warranty manager may issue you with a returns number and arrange the collection and replacement. Please note that the collection and replacement may not be on the same carrier visit.

What do I do if I have received an incorrect product?

Ring the sales representative with whom you have originally placed the order. Discuss the problem with the Sales Representative to check if it is our misunderstanding. If it is our misunderstanding, we will pass your call through to the Warranty manager who will issue you with a returns number and arrange collection and replacement of the product.

What do I do if the courier arrives but the consignment note mentions more boxes than are being received?

Cross out the number of items listed and change it to read the appropriate number received. Ring your Sales Representative to contact the courier and to keep you informed.

What if my product won't work?

If you have our 3 year on-site warranty, call 1 800 623 394.If the problem is diagnosed as a software problem ring(02) 9700 9354 for a Technical Support Representative. Please call with the product on hand to evaluate any suggestions Technical Support will give you. If you do not have our 3-year on-site warranty, contact Technical Support. If your product has been diagnosed as faulty you will be issued with a returns number. Your Technical Representative will then arrange the collection process with you. Please note the RA # for future questions on the progress of your case.

Adelong's locations for your convenience

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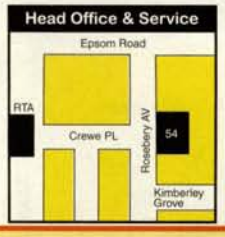
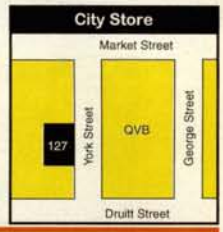
Fax: (02) 9669 3216





Important points to remember

- A returns authorisation number must be obtained before the return of any product.
- Failure to display the number will result in the return being refused.
- The package must not be defaced in any way and must be securely packaged.
- Faulty items will be tested on receipt. If no fault is found the product will be returned to you by Adelong with a 25% resocking fee.
- No opened software packages will be accepted back. (please check details on the box before opening).
- Warranty repairs - carriage must be paid for by the customer.
- We offer the full manufacturers "dead on arrival" warranty to our customers.
- Deposits are non refundable.
- A returns number is valid for 14 days only.

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Telephone: ( ) _____ Fax: ( ) _____

Code	Description	Qty	Price
Month		Total	

Payment by: Cheque ☐ Mastercard ☐ Bankcard ☐ Visa ☐ Amex ☐

Exp ☐☐ / ☐☐ Card No: ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

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Fax: (02) 9669 3216

Signature: _____

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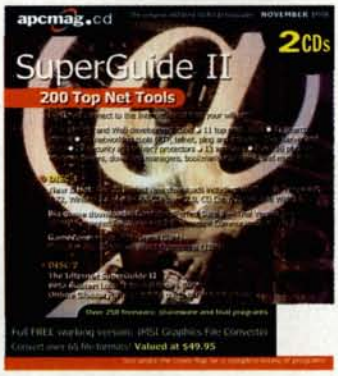
The cover disc: apcmag.cd

This disc has two main aims:

- To provide fast, easy access to the files and resources we talk about in *APC* and to save you download time and money;
- To make it easy for our readers to get on the Internet so they can use our new interactive Web site.

The kit contains browsers, file-transfer programs, Mail and News readers and much more for each of the major operating systems. To make it as easy as possible for readers to get online, we've also included reader offers and a sign-up kit.



apcmag.cd aims to complement both the magazine and *APC*'s Web site. The concept is simple: when you read about a program in the magazine, such as a piece of software from a Shareware column, you need only insert **apcmag.cd**, browse it with your favourite Web browser, and download the file directly from the CD. Articles which include related items on the CD are identified by the ◉ symbol at the top of the page. Each piece of software includes instructions on whether you will need to unzip the file before installing it; most also include Readme files.

Using the CDs

Everything you need to use **apcmag.cd** has been created in HTML. You don't need any special software to access the disc, other than a standard browser, and it will work on most common platforms.

We've provided the software on the CD for the convenience of our readers — to save you the effort of locating and downloading around 600M of material yourself.

As with any site on the Web, the software on this CD is provided as is, in the hope that it will be useful to you, and without any warranty, express or implied. If you're interested in a product or service we review or refer to, contact the company that dis- tributes or supports it for more information, or to discuss any problems you may have with it.

You should carefully read the licensing agreements and honour any evaluation or shareware terms specified, read all instructions and Readme files, and virus-check every program before use, as with any software available on the Web.

While we've taken every care to ensure that the software provided is useful and that it works, we cannot accept responsibility or liability for any of the products included.

How to run the CD

Windows 95 and NT users

This CD uses an Autorun feature for Windows 95 and NT systems. Just insert **apcmag.cd** and your browser will automatically load with the **apcmag.cd** front page.

Note: First-time users of the CD will be prompted by a browser set-up program (SETUP32.EXE) which will allow you to install a browser or update your current browser. This program is only loaded once, and subsequent use of the CD will automatically start your installed browser.

Win 3.x, OS/2, Mac, Linux

Simply launch your favourite browser and load the file DEFAULT.HTM in the root directory of the CD.

If you don't have a browser, run the file INSTALL.BAT in the root directory of the CD.

The CD has been tested using Netscape Navigator 3.0 and 4.0, and MS Internet Explorer 3.0.

Conditions of Entry

Instructions on 'How to Enter' form part of the Conditions of Entry of all competitions in *APC* November. Entry is free and open to all residents of Australia other than employees of ACP Publishing Pty Ltd (ACN 053 273 546), suppliers of competition prizes, their families and associated agencies.

The contests close last mail November 19. Enter according to the instructions supplied with the individual competition. The contest will be judged by a panel appointed by ACP Publishing Pty Ltd on November 19, 1998. The judges' decision in relation to any aspect of the competition is final and binding on every person who enters. No correspondence will be entered into. Chance plays no part in determining the winner. No responsibility is accepted for late, lost or misdirected entries. All entries become the property of ACP Publishing Pty Limited, the promoter, 54 Park Street, Sydney, NSW 1028.

The prizes are not transferable or redeemable for cash. Any change in the value of the prizes occurring between the publishing date and the date the prizes are claimed is not the responsibility of the promoter.

Prizewinners will be notified by security post and their names published in the January issue of *APC*.

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Phone: (03) 9823 6333
Fax: (03) 9820 1134
Electronic mail is preferred.
Internet: APC@acp.com.au

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Phone: (02) 9288 9123
Email: apccasual@acp.com.au
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We can run out of issues quickly, so please contact Kim Edwards before sending a cheque.

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Contact: Workshop
Fax: (02) 9264 6320
Email: workshop@acp.com.au
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Company: Re-Creative Marketing
Contact: Donna Lee
Phone: (03) 9326 3244
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Editorial submissions

We welcome readers' letters, ideas for articles or reviews, information on new products and companies, and any insight they can give into the PC industry or the use of technology.

Article ideas

Please let us know if you have an idea for an article or review you'd like to write, or that you'd like to see us cover in *APC*. We appreciate submissions, but can't guarantee a reply. Please send (preferably by email) a brief résumé with an outline of your experience and interests, and a sample of your writing with an outline of the article you have in mind.

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Please send press releases to the address listed at left, via email to press@acp.com.au or to one of the following specific section editors:

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Features	Helen Dancer hdancer@acp.com.au
Reviews	Lachlan Botticchio lb@acp.com.au
Technical Features	Selina Mitchell smitchell@acp.com.au
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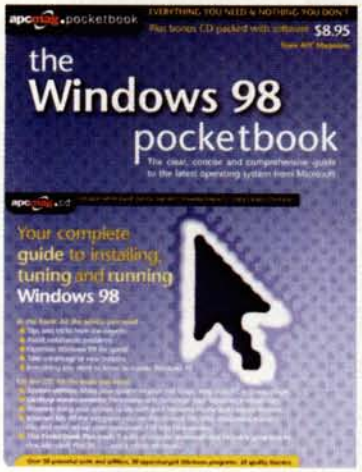

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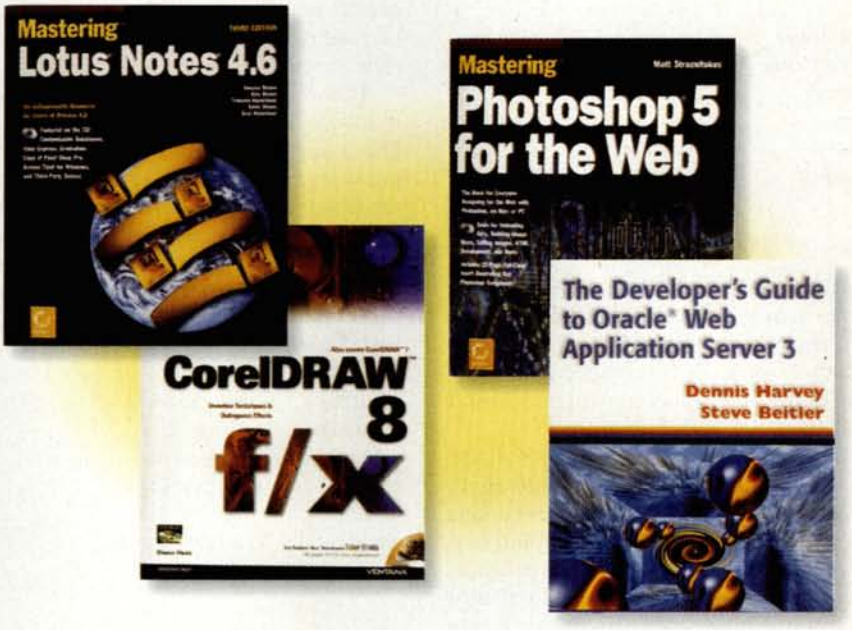
Creating the drawing effects you desire is just one of the topics you can learn about in this month's Bibliofile.

Get the look



CorelDRAW 8 f/x

Learning the mechanics of a program is one thing; getting the results you want is another. *CorelDRAW 8 f/x* concentrates on the latter, and demonstrates how to achieve various effects. Although some of the drawings have the stereotypical CorelDRAW look, others are in tattoo, graffiti and comic book styles. Techniques including photo collages — more often associated with programs such as Photoshop — are covered, along with methods for drawing objects such as chains and ropes.

Various tips are scattered throughout the book, such as improving the appearance of fountain fills with a black endpoint by adding cyan, magenta and yellow (as appropriate to the next colour in the fill) to the black ink, and coping with miscellaneous CorelDRAW quirks.

Hunt is clearly an enthusiast, having fun with the program and the book, but what does he mean by 'froofy'? He writes for people who illustrate for a living, focusing on how to do the job efficiently. For instance, when using CorelDRAW to create graphics for the Web, his tip is to use screen capture rather than export filters to create screen-resolution bitmaps. He also provides advice; he suggests illustrators charge for the skill needed to do a job, not the time it takes.

Practically all of the artwork and its components are on the companion CD-ROM. Most of it is Hunt's own, and he gives the buyer permission to reuse it. Some commercial items could not be included, but some add-on software demos are included.

A 96-page glossy colour section shows finished versions of the projects. This is useful, as some of the effects aren't very clear in the smaller black-and-white images in the body of the book.

Stephen Withers

Author	Shane Hunt
Publisher	Ventana
Distributor	Woodslane
Phone	(02) 9970 5111
Price	$110
ISBN	1-56604-803-6
Rating	★★★☆

Mastering Lotus Notes 4.6

Claiming any reasonably complex book is "ideal for users of all experience levels" is all too often mere hyperbole. While there is an element of this in *Mastering Lotus Notes 4.6*, it has sufficient detail and explanation to please most readers.

Best-suited to new to semi-experienced users, *Mastering Lotus Notes 4.6* moves from defining the elements of Lotus Notes to setting up documents and icons, through to Notes development and design.

Mastering Lotus Notes 4.6 uses the familiar approach of guiding users through Notes concepts by building tutorial-based databases and applications. This approach is enhanced by explaining all related Notes concepts in sideboxes. While this does tend to bulk out the text, it extends its usefulness by presenting a logical base for referential searching. Introducing concepts in this way also enables users to experiment with other design ideas; instead of just designing around the tutorial, the reader is prompted to experiment and learn all the facets of Notes design.

As a result, the layout is somewhat cluttered. For example, in the first few chapters you get an explanation of database concepts (good for new users), followed by a comprehensive list of changes from previous Notes versions (of general use only to experienced users).

Because of the author's slow and methodical explanation, new users are unlikely to feel overwhelmed by the sheer

Guide to ratings

★	Yeltsin: Oh dear
★★	Netanyahu: A little shaky
★★★	Habibie: Able to stand its ground
★★★★	Tony Blair: Reliable support
★★★★★	Bill Clinton: Enough info, already

scope and length of the book. This, though, is a double-edged sword — it makes the work less appealing to more knowledgeable users, who must wade through explanatory notes to find the real meat of the book.

An accompanying CD-ROM contains the sample files used in the book, along with a variety of shareware demos for useful Notes-supporting utilities.

Alex Kidman

Author	Kenyon Brown, Kyle Brown, François Koutchouk, Kevin Brown, Scot Haberman
Publisher	Sybex
Distributor	Addison Wesley Longman
Phone	(02) 9428 8000
Price	$99.95
ISBN	0-7821-2342-2
Rating	★★★★

Photoshop 5 for the Web

Photoshop 5 for the Web is a stylish guidebook, with plenty of screenshots, examples, exercises and profiles of designers and their work. The accompanying CD is easy to use and is packed with demos and full versions of useful programs.

Unfortunately, the book does not live up to its claims of being at an intermediate/advanced level. The book rarely gets out of first gear. It has an annoying tendency to gloss over the features of whatever it's discussing, without actually explaining how to do anything. While beginners may find the book instructive, anyone with experience in either Photoshop or Web design will find this book frustratingly low on detail.

The first section of the book, 'Photoshop Fundamentals', is a basic tutorial on the features of Photoshop. The chapter on filters, for example, shows you how to apply filters, with large before and after shots of the various filters. But it almost never gives any hints as how best to use a particular filter, or how to adjust its settings for different effects.

The second section, 'Photoshop and the Web', is also superficial, and contains only one whole chapter — 28 pages — devoted to designing graphics for the Web.

The last section discusses Web page design, from text handling, tables, frames and embedded images to DHTML and style sheets.

The whole concept of the book begs the question: why spend over $1,000 buying Photoshop, when dedicated Web graphics packages such as Fireworks or ImageReady are much cheaper and better at creating graphics for Web sites? And while the question is raised in one of the book's appendices, I'm afraid to say the answer given is short and superficial.

Josh Mehlman

Author	Matt Straznitskas
Publisher	Sybex
Distributor	Addison Wesley Longman
Phone	(02) 9428 8081
Price	$99.95
ISBN	0-7821-2230-2
Rating	★★☆

The Developer's Guide to Oracle Web Application Server 3

For developers looking to harness the power of Oracle's Web Application Server to develop three-tiered distributed applications, *The Developer's Guide to Oracle Web Application Server 3* is worth a look.

The *Developer's Guide* covers a range of topics including: HTTP, CGI and CORBA basics; Oracle's PL/SQL, Java, Perl, and LiveHTML and ODBC cartridges. It also covers installation and basic administration of Web Application Server, and PL/SQL and Java Cartridge programming. That's a lot to cover in just over 400 pages.

Because of the complexity of the Web Application Server — coupled with the intricacies of SQL and Java — the book rarely goes into much detail about any specific topic. To really benefit from it, the reader would need a good understanding of all the concepts presented. Its strength is that it ties together all of these components, and illustrates how to use them with Oracle's Web Application Server. It does not, however, provide sufficient information for a newcomer to become productive immediately.

The other notable characteristic of the book is that it is heavy on code and explanations of the code. The first few chapters provide a quick description of some of the technologies, and the rest of the book looks at developing large sample applications. If you prefer more verbose instructions, you may wish to look elsewhere.

Travis Simon

Author	Dennis Harvey and Steve Beitler
Publisher	Addison Wesley Longman
Distributor	Addison Wesley Longman
Phone	(02) 9428 8066
Price	$89.95
ISBN	0-201-30960-2
Rating	★★★

Off the Shelf

Title	Author	Publisher	Distributor	Phone	Price	ISBN
Bill Gates Speaks	Janet Lowe	John Wiley & Sons	Jacaranda Wiley	(02) 9805 1100	$29.95	0-471-29353-9
XML in Plain English	Sandra Eddy	IDG Books Worldwide	Woodslane	(02) 9970 5111	$54.95	0-7645-7006-4
Mastering Java 1.2	John Zukowski	Sybex	Addison Wesley Longman	(02) 9428 8000	$109.95	0-7821-2180-2
Mastering Visual Basic 6	Evangelos Petroutsos	Sybex	Addison Wesley Longman	(02) 9428 8000	$109.95	0-7821-2272-8
Fusion 3 Bible	David Hague	IDG Books Worldwide	Woodslane	(02) 9970 5111	$110.00	0-7645-313-28
Master Photoshop 5 Visually	Ken Milburn	IDG Books Worldwide	Woodslane	(02) 9970 5111	$89.95	0-7645-6045-X
Professional Photoshop 5.0	Dan Margulis	John Wiley & Sons	Jacaranda Wiley	(02) 9805 1100	$120.00	0-471-32308-X
Introducing Microsoft Windows NT 5.0	Adrian King	Microsoft Press	Woodslane	(02) 9970 5111	$49.95	1-572-318-759
Teach Yourself TCP/IP Network Administration in 21 Days	Brian Komar	Sams	Prentice Hall	(02) 9454 2200	$59.95	0-672-31250-6
Web Developer.com Guide to Producing Live Webcasts	Jeannie Novak	John Wiley & Sons	Jacaranda Wiley	(02) 9805 1100	$75.00	0-471-29409-8

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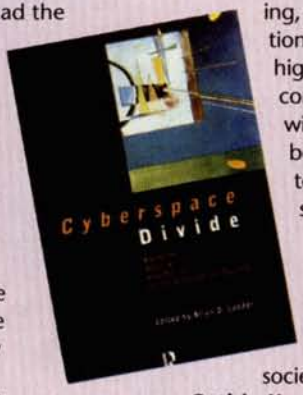
Australian Personal Computer

Perspective: Distance divided

Cyberspace Divide

As a collection of essays that examine equality and policy in the information society, *Cyberspace Divide* had the potential to be a compelling read. Unfortunately, the delivery falls short. The book comprises 13 papers, the majority of which were presented by academics at a conference organised by the Community Informatics Research and Applications Unit at the University of Teesside in the UK. Little has been done by the editor to massage the papers into a format suitable for a broader audience. They remain very formal and structured in their approach, and heavily laden with references and citations.



The authors question the utopian view of the new information and communications technologies, and adopt a critical, cautious approach to the social and economic ramifications of the 'cyberspace divide'. Each of the contributions falls under one of three sections. The first challenges the contention that cyberspace will foster equality, suggesting that lack of access to communications may affect people's material welfare. The second part focuses on social issues such as gender, ethics and virtual versus actual reality. The final section looks at technology policy, including government investment, health care and policies for an information society.

The underlying message throughout the papers is clear: access to information will more than likely remain the preserve of the affluent minority. One author makes the point that only in North America, Japan, Europe and Australia is there a genuine national communications infrastructure. "There may be a full Internet connection at the university in Ulan Bator, but 10km away there are no telephones," writes Mike Holderness.

Many of the papers are based on UK experiences (all writers are academics at various UK tertiary institutions), but many manage to put the cyberspace divide into an international perspective.

The five-page glossary at the end of the book is indiscriminate, listing words such as electronic mail, but omitting words such as cyberculture. As you would expect in an academically inclined book, the bibliography is extensive.

As a reference for students of computing, social policy or communications, *Cyberspace Divide* deserves high marks. It is a compendium of conference papers that explores with insight the relationship between the current wave of technological change and its social consequences. It would require further editing and restructuring, however, to make it a balanced examination of how these new technologies will structure our society.

Cathie Kennedy

Editor	Brian Loader
Publisher	Routledge
Distributor	Jacaranda Wiley
Phone	(02) 9805 1100
Price	$49.95
ISBN	0-415-16969-0
Rating	★★★

The Death of Distance

The fundamental premise of *The Death of Distance* is that the convergence of telephone, television and computers is "loosening our grip on geography". Supporting this framework, author and BBC presenter Frances Cairncross has ensured her book has a truly global context, citing events and case studies from around the world. There are even numerous Australian examples included, such as the government debate last year over whether to pass a bill to allow Telstra to time-charge local calls to the Internet while continuing to exempt ordinary voice calls.

Cairncross leaves few stones unturned, covering the gamut of issues from pricing, privacy, security, access and control to employment, the economy, competition and culture. The death of distance, she suggests, will see the emergence of a new global society, where loose-knit corporations, the use of English as a common language, and a convergence of home and office will prevail. In addition, as people will spend more time working from home, central business districts will be reborn, and will be transformed from office environments to centres of entertainment..

With recommendations from the likes of News Corp chairperson Rupert Murdoch and British Telecom chairperson Sir Iain Vallance, you'd expect this book to be a little more extensive in its coverage on the impact of the communications revolution. Speculation on how the convergence of technologies will shape businesses, government and society in the next century is only covered to any extent in the final three chapters. The first two-thirds of the book is devoted to an historical perspective and a discussion on current trends.

Cairncross quotes Alfred Marshall, one of the fathers of modern economics, who said, "The full importance of an epoch-making idea is often not perceived in the generation in which it is made." How true. Perhaps this partly explains why this book is light on prediction.

While *The Death of Distance* has only just been released in Australia, it was first published in 1997. You can therefore assume that Cairncross first began to put pen to paper sometime in 1996. Two years is a long time in this industry, and while it seems the publisher went to great pains to ensure the book was totally up-to-date at the time of publishing, a few cases still slipped through the editing process.

For example, the book suggests that in the next few years, organisations will begin to use communications links to make internal information accessible to suppliers, distributors and customers. These processes are already firmly entrenched in many organisations around the world.

Criticisms aside, *The Death of Distance* is still a well-written, well-researched and easy-to-read book that will appeal to a broad audience.

Cathie Kennedy

Author	Frances Cairncross
Publisher	Orion Business Books
Distributor	McGills
Phone	(03) 9602 5566
Price	$45
ISBN	0752812505
Rating	★★★★

Lose yourself in fantasy land, or find out more about the real world.

Enter the dragon

Mulan Animated StoryBook

As inevitable as day coming before night, a Disney animated feature is preceded by an avalanche of spin-off memorabilia, ranging in quality from very good to downright shoddy. Thankfully, the Mulan Animated StoryBook (ASB) sits comfortably at the high end of the spectrum.

Intended as a learning tool for children aged between five and nine years old, the Mulan ASB combines a continuous narrative with small games and reading activities. Unlike some Disney products, the original cast does all the voices. Mushu the dragon, ably voiced by Eddie Murphy, guides the player through the story under the stern vocal guidance of the first ancestor, played by 'Star Trek's George Takei.

Mushu's task is to take the story of Mulan to the emperor, but he accidentally loses the magical scrolls the story is written on, and it's up to the players to help him find the missing scrolls and restore their magic. The player is led through the stages from finding the scroll to restoring all of the missing words before moving on to the next scene. The accompanying instruction manual gives a complete solution, so parents with easily frustrated kids should be able to guide them through any difficult tasks, but there aren't many. If players do get stuck, Mushu has a vast collection of verbal hints to help the player.

As individual scroll sections are found, the ancestor reads them out to the player. Difficult words have explanatory animations and a list of synonyms.

Apart from the storybook elements, there's a selection of games and activities, including mah-jong, a logic puzzle, and a traditional Japanese Kisekae (paper doll) game. The skill level can be adjusted from easy to quite difficult, so parents who are helping their children can entertain themselves too.

The only negative with the Mulan ASB is in the amount of spin-off advertising in the box — from Web site advertising to sing-along videotapes; any child wanting to see what else is in the exciting new box is immediately targeted.

Overall, Mulan is a high-quality, engaging combination of storybook and games and we highly recommend it.

Alex Kidman

Publisher	Disney Interactive
Distributor	Dataflow
Phone	(02) 9417 9740
Price	$69.95
Requires	Pentium 90, Windows 95, 16M RAM, 4x CD-ROM drive, 20M hard disk space; PowerPC 75MHz, System 7.5, 24M RAM, 4x CD-ROM drive
Rating	★★★★

FloorPlan 3D Design Suite

Designing your dream home on paper requires a vivid imagination, but with a bit of patience IMSI's FloorPlan 3D Design Suite can turn your ideas into images of simply amazing quality.

It includes hundreds of types of walls, windows, electrical fixtures, fireplaces, spa baths, plants, whitegoods and so on. Items only come in a few standard sizes, but new objects can be designed by copying and resizing them. According to IMSI, completely new items can be created using compatible design tools such as 3D Design Studio.

We designed a house using an overhead 2D view, positioning and sizing the quite intelligent components. FloorPlan 3D includes polygon, texture-mapped and wireframe 3D walk-through modes as well as outside isometric views; although navigation was clumsy at first, with a little patience we were able to view our creation from any location, angle and elevation.

We easily modified individual objects to taste, with materials (such as glass, polished metal, plastic) and textures (such as stucco, marble, brick and tiles) for every object accurately reflected in the texture-mapped 3D walk-through view. Although we couldn't create our own textures (which would be useful for scanning tile, carpet or other samples from stores), elsewhere FloorPlan 3D's eye for detail was obvious. For example, lights can be halogen, fluorescent or incandescent and of any wattage.

Such finetuning would be useless in most home design packages because the subtle differences they introduce would be invisible onscreen. However, FloorPlan 3D's photorealistic rendering engine factored such details to create stunning previews of our virtual house. Patience is the key, though. It took us over an hour to render the top-quality image shown above.

FloorPlan 3D includes all the other features you'd expect: automatic roof creation, multiple levels with automatic stairs, materials and price lists, and so on. The suite includes a decent garden design package and a multimedia encyclopedia of sample home designs, but they are poorly integrated with the centrepiece FloorPlan 3D.

APC's February roundup (see page 96) found most home design packages compromised on either quality or features; this title has enough of both to make it the only choice for the serious home designer.

David Braue

Publisher	IMSI
Distributor	IMSI Australia
Phone	(02) 9319 7533
Price	$119.95
Requires	Pentium 90, Windows 95, 24M RAM, 2x CD-ROM drive, 55M hard disk space
Rating	★★★★

Interactive News

There is still a lot of infighting between manufacturers over the emerging technologies for home entertainment data storage, but at least some aspects are now standardised. The MultiRead specification was first proposed back in 1997 by the Optical Storage Technology Association (OSTA) which at the time was managed by Hewlett-Packard and Philips. Essentially, it details the requirements for a drive to read or play audio CDs, CD-ROMs, CD-Recordables (CD-R), and CD-Rewritables (CD-RW). Manufacturers aren't required to obtain MultiRead specification approval from OSTA, but representatives from the association have said 31 manufacturers from around the world have expressed an interest in complying with the specifications — which represents around 98% of the optical drives manufactured in the world. They might not be able to agree on anything else, but at least it's a start.

The first portable DVD players have arrived. Although it's not on local release yet, Panasonic's PalmTheater DVD DL10 features a tiny 5.8in wide-screen LCD, a built-in speaker and a headphone jack. Good news for frequent flyers who don't like the in-flight movie on offer, but realistically a screen this size isn't going to have many practical uses for most people. Both Samsung and Sony have other ideas for portable DVDs, though, such as eyeglasses for viewing the movies rather than small LCD screens, which sounds a lot more sensible (if they work, of course).

There's plenty of controversy surrounding the MP3 audio format, mostly because of how easy it is for copyright audio material to be pirated on the Internet. However, Diamond Multimedia is throwing its weight behind the format, announcing it will release the Rio PMP300, a portable MP3 player akin to the Walkmans and Discmans of old. The unit will weigh a scant 70g and will come with 32M of flash memory (upgradable to 64M).

Gareth Jones

Wallace & Gromit Print-o-matic

This is definitely one for kids. It basically consists of 11 templates from which you design personalised Wallace & Gromit stationery, posters and bookmarks.

There's a selection of 140 colour and black-and-white drawings and photographs of Wallace & Gromit characters, including Feathers McGraw the penguin, Shaun the lamb, and Preston the Robodog. The stars themselves appear in some of their most popular poses, including several Christmas-themed pictures.

There are two sections, the Identi-kit and the Party-kit. The first allows you to personalise your own writing paper, posters, ID cards, certificates, labels and bookmarks.

The Party-kit includes invitations, gift tags, cards and wrap, and placemats. These are all created from the basic templates which are customised by adding your selections from the range of pictures of Wallace & Gromit characters, as well as choosing a background design and inserting text. You have a choice of several fonts, including Wallace's own Wensleydale font, and colour and size can both be adjusted. Having personalised Wallace & Gromit stationery may be fun, but overall the CD is of questionable value. It is fairly cheap, well designed, and easy to use, but the amount of ink needed to print a full-colour page makes personalised stationery cost-prohibitive for most people. There are black-and-white images for those who don't have access to a colour printer, but a monochrome Gromit isn't much fun.

Claire Waddell

Publisher	BBC Worldwide
Distributor	Roadshow Entertainment
Phone	(02) 9552 8700
Price	$39.95
Requires	486DX2, Windows, 8M RAM, 2x CD-ROM drive
Rating	★★★

World Book 1998 Deluxe Speech Edition

Sometimes people do things just because they can. They squat on the top of flagpoles for weeks on end. They get married underwater. And IBM puts out the World Book (Speech Edition).

Adding speech to an encyclopedia like this has little point other than to bolster sales of the powerful home computers that are needed to run the technology. The blurb on the box says the built-in run-time version of IBM's ViaVoice allows people to dictate the draft of an essay using the supplied microphone and headset. It also claims it has fast and easy navigation, and searching using the same voice control system.

Phooey. Anyone who knows the reality of voice dictation, especially for schoolkids with changing voice profiles and imprecise diction, will realise this is a mere 'because it can be done' exercise. Luckily, it doesn't detract from the worthiness of the World Book contents.

IBM has trodden the middle path between Encarta's multimedia overdose and Britannica's textual tedium. Although the menu looks like it was designed by a year seven student, it is easy enough to use the category and topic options.

There is a good range of search and discovery options, including timeline and homework wizards. One aspect that lets the product down a bit is the image quality. The low-resolution videos and animations, and fairly basic world maps mean the developers still have some work to do for the 1999 edition.

Jeremy Torr

Publisher	World Book
Distributor	Dataflow
Phone	(02) 9417 9700
Price	$189.95
Requires	Pentium 166, Windows 95, 32M RAM, 2x CD-ROM drive, 100M hard disk space, SVGA
Rating	★★

Go flashy if Leisure Suit Larry's your style, or battle the Forces of Darkness to save Whisky the dog.

Bright lights, dark hearts

Heart of Darkness

Please don't make me play this game again! Frustrating flick-screen platform games were never my thing. Heart of Darkness (HoD) is designed to drive you nuts.

When it comes down to it, this heavily hyped, TV-advertised production for kids really belongs in the beginning of the decade, not in 1998. In fact, writing on it began in 1992. Sure, the background visuals and animations look pretty cool on TV, but in a world of 3D-enhanced platformers such as Mario 64 and Croc, this 2D pixel-perfect jumping stuff is well past its use-by date.

HoD (no relation to the Joseph Conrad novel) stars a kid called Andy, whose dog Whisky is stolen (for an unexplained reason) by the Forces of Darkness from an alternate reality. Andy seems to know all about this menace and happens to have a homemade aeroplane in his treehouse for such occasions. With his homemade blaster gun and helmet, he flies into a craggy hell not unlike a cartoon version of Tolkein's Mordor. From this point on, the game consists of repetitive platform action and long, plot-development cartoons which are entertaining but far from original.

The tasks are fairly simple, so the designers have relied on a pretty lame

technique to extend playing time — you can't actually save a game until you pass an approved 'waypoint'. If you die before the waypoint, you're thrust back to the start of the previous section. By the 29th attempt to jump onto the invisible ledge on the fifth flick-screen of the 53rd section, which requires you to have made 29 successful journeys through the previous four flick-screens, you'll need stress therapy.

If you've never played a computer game before you might love the cuteness of HoD, but there's so much more scope for being entertained, rather than frustrated, by other titles. HoD deserves none of the success its high profile will undoubtedly bring. I can only recommend it to animation aficionados (there's some quality work on this CD that you can replay to your heart's content once you pass the relevant point in the game) and to those who want to hear their soundcard croon — it has a beautiful orchestral soundtrack and some wonderful effects.

Imagine a beautifully wrapped present delivered with a singing telegram. You unwrap it with anticipation, uncovering a fragrant, multicoloured box. Inside is a cold, stale McDonald's hamburger. Welcome to Heart of Darkness.

Simon Vandore

Distributor	Electronic Arts
Phone	(02) 9955 7744
Online	http://www.heartofdarkness.com/
Price	$79.95
Requires	486DX2/66, 16M RAM, 2x CD-ROM, 1M graphics card, DirectX-supported soundcard
Classification	G
Rating	★☆

Leisure Suit Larry's Casino

Larry Laffer has been around almost as long as PC games, and it's beginning to show. The latest offering from Sierra is Leisure Suit Larry's Casino (LSLC), and at first glance this would seem to be a perfect pairing — casinos have a reputation for being gaudy, sleazy and expensive, and Larry has a similar reputation. Be warned from the outset, if the theme of the game isn't to your taste, find another casino-style game — the main appeal in LSLC is supposed to be Larry's sleazy world.

LSLC offers a variety of traditional casino games set against a typical Larry-style setting. Blackjack, poker, craps, roulette, slot machines — all these games are there. One of the main hooks for LSLC is the option of Internet play through a dedicated server. This makes the offline game a practice session — if all the player's

money is lost offline, it's simply replaced, which is not the case online.

Online play opens up previously inaccessible portions of the game, although apart from the party games these are all just variants of IRC rooms. It's a pity there was no option for network play, and the game really can't be recommended for anyone without a reasonably fast Internet connection. It's also worth noting that despite the G rating and a content advisory upon signing onto the won.net Web server, the language online was distinctly adult in nature — but then Larry was never really meant for kids.

The casino is delivered to you in standard Larry-style cartoons, which are serviceable, if a little plain. Larry provides an intro commentary to all the games, and offline the computer players talk as the game progresses. LSLC offers a competent casino simulation and should appeal to gamblers and Larry fans alike.

Alex Kidman

Distributor	Wolf Interactive
Phone	(02) 9417 9600
Online	http://www.sierra.com/
Price	$69.95
Requires	Pentium 90, 16M RAM, 2x CD-ROM drive, 120M hard disk space
Classification	G
Rating	★★★

Spec Ops: Ranger Assault

Spec Ops: Ranger Assault is a real-time 3D action game based on the US Army Rangers — the elite Special Forces which are called on to perform Commando-style raids in times of crisis.

Spec Ops uses a third-person perspective, showcasing an impressive graphics engine which makes the smoothly animated Rangers seem more like characters in a movie than in a game. The missions are challenging, pitting the Rangers against Russian Special Forces, North Koreans and the soldiers of a South American drug lord.

Unfortunately, the enemies' behaviour can be easily predicted as their artificial intelligence doesn't vary according to the characteristics of each different army. The physical terrain is another matter; smooth landscapes conceal enemy tanks, snipers and booby traps. The player has to control two Rangers in each operation, choosing from riflemen, grenadiers, machine gunners and snipers, depending on the requirements of the mission.

Strangely enough, the choice of Rangers doesn't correspond to the plot at all. You need two Rangers to secure a crash site in one mission, and then in the next mission you have to use two different Rangers to evacuate the same site. The Ranger AI is also in need of a patch; when Rangers are not directly controlled they are capable of doing some pretty stupid things and jeopardising a whole mission. It's best to keep a close eye on everyone and to switch between Rangers to get them out of trouble.

These small imperfections seem inconsequential if you really like the game, and if you have a 3Dfx card there is little not to like. Unfortunately, if you don't have one, don't bother buying Spec Ops: Ranger Assault. Although the game requirements don't specify it, Spec Ops was unplayable on a Pentium II with an AGP graphics card. It ran brilliantly on a Pentium 200 with Monster 3D.

Aside from being a display in graphics power, Spec Ops: Ranger Assault is a great battle simulation. The controls are easy enough to be picked up by anyone in a matter of minutes, although the short manual doesn't explain the importance of using the GPS control to find anything in the large mission areas.

Spec Ops: Ranger Assault will appeal to anyone who reads Tom Clancy novels and remembers the nicknames for different Special Forces

Ari Weisz-Koves

Distributor	GT Interactive
Phone	(02) 9902 3000
Online	http://www.zombie.com/
Price	$89.95
Requires	Pentium 166, 16M RAM, 8x CD-ROM drive, 60M hard disk space, DirectX-compatible soundcard and video card
Classification	M15+
Rating	★★★☆

Castrol Honda Superbike World Champions

This title may be misconstrued as a piece of promotional material for two superbike sponsors, but Castrol Honda Superbike World Champions (CHSWC) is a pretty good game.

The justification for having the familiar logos plastered all over the game is that the real Castrol Honda superbike team was associated with its development. The inside knowledge of riders and engineers has resulted in a realistic superbike championship experience.

Most gamers have inevitably played a racing car game or two. The two-wheeled variety of racing simulation is very similar to the four-wheeled. You need to be aware of the different handling a superbike requires compared to a race car; and be prepared to take a little time mastering the braking, leaning and gearing down that is involved when taking corners. Of course, if you take advantage of all the options, such as braking and steering assistance, you will have few troubles, but where's the fun in that?

Along with braking and steering assistance, CHSWC has a training mode that allows you to follow another bike and learn how to handle each individual track. You can adjust the game to suit your own taste by selecting a difficulty level from novice to ace and toggling other options, such as damage, tyre wear and type of transmission.

There are 10 tracks on which to race, all modelled on their real-life equivalents. The fact that it is a disadvantage to venture off the track (unlike some games, where travelling on the edges is the same as on the tar) may be seen as a negative by some, but I think it's a positive.

Perhaps the biggest dilemma facing those who play CHSWC is which kind of

controller to use. The keyboard is rarely a good option and joysticks are more at home in a cockpit. A steering wheel is certainly the pick of the bunch when it comes to traditional controllers, but it is no replacement for those bike handlebars you find in arcades.

Kieran McNamee

Distributor	Metro Games
Phone	(03) 9329 2999
Online	http://www.interactive-entertainment.co.uk/
Price	$55
Requires	Pentium 166, Windows 95, 32M RAM, CD-ROM drive, 3D graphics card
Classification	G
Rating	★★★☆

Total Annihilation: Battle Tactics

Total Annihilation has become a landmark game in the real-time strategy (RTS) genre. Its 3D terrain, brilliant resource management, huge range of combat units, and gorgeous symphonic score ensured an army of followers for Cavedog, not to mention a swag of industry awards.

Battle Tactics is the second add-on pack (after The Core Contingency) to be issued for Total Annihilation. Battle Tactics offers games and lots of them, 100 missions to be exact, ranging from short, sharp skirmishes that can be completed in under 10 minutes, to epic encounters that can last hours.

This is not an expansion pack in the usual sense. It doesn't come with a bunch of new units, or a mission editor, or any of the things that might be expected in an add-on pack. This is simply because the original was so complete, and since its release a host of new units have been developed by Cavedog for free download.

Cavedog has looked to the needs of experienced fans chasing a fix, as well as novices keen to try RTS for the first time.

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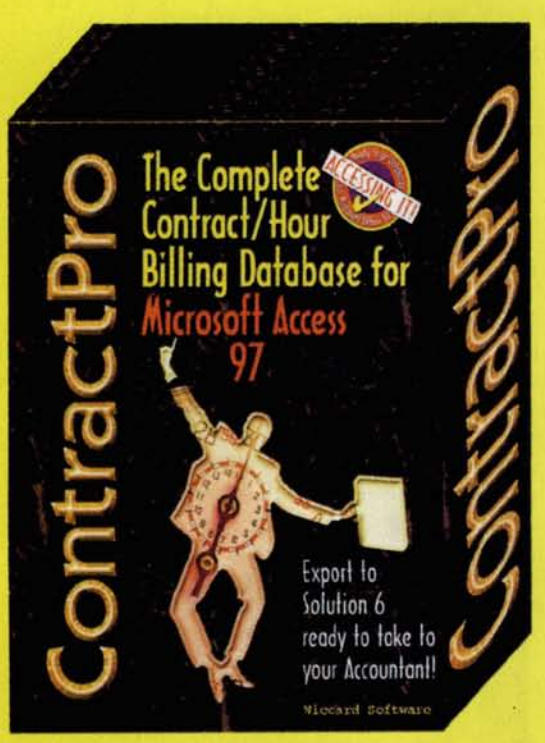

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The difficulty levels are well tuned, so both beginners and experts will get value out of each mission. The missions are not linked in any way — you can jump in wherever your mood or ability dictates.

To some extent, Cavedog has taken the approach of an instructor, designing missions that teach you to use the available units to achieve your tactical goals. The downside to this is that construction and resource management — one of the highlights of the original game — are largely neglected.

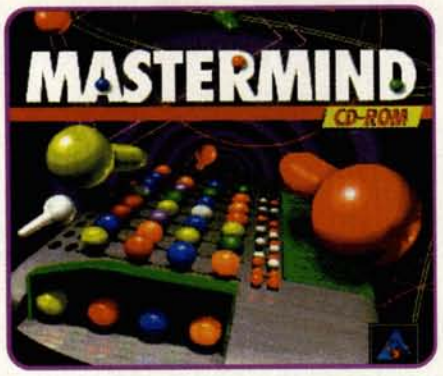
One of the chief strengths of Total Annihilation is its multiplayer capability, so experienced players may be disappointed to hear that Battle Tactics offers little in this area apart from some new maps. The graphics appear a bit dated now as well, so new players might be tempted to look elsewhere. Nevertheless, if you're a Total Annihilation fan craving some single-player action, then look no further. You'll find it here, in bulk.

Jon Gill

Distributor	GT Interactive Software
Phone	1900 957 665
Online	http://totalannihilation.cavedog.com/
Price	$29.95
Requires	Pentium 133, 32M RAM, 4x CD-ROM drive, VGA 256-colour video, 100M hard disk space
Classification	G
Rating	★★★☆

Mastermind

Mastermind should not be confused with the well-known UK TV quiz show in which players show off their knowledge on obscure topics (and which BBC Interactive released on CD last year; see *APC* March 1997, page 227). Instead, this is a computer game based on the board game and inspired by the TV show, which offers simpler but no less cerebral entertainment.



The basic gameplay for Mastermind is astoundingly straightforward, and has been used in computer games since the early days of Basic. You basically just try to guess the secret combination of four coloured orbs; a red peg is awarded for each correctly positioned and coloured orb and a white peg for each correctly coloured, incorrectly positioned orb.

To justify the release of a CD-ROM version, Hasbro has added in a host of new options, including simpler versions for children featuring space and jungle settings, combat versions where both players set a code at once, and, of course, network play.

All these features are neatly implemented, but at the end of the day, the basic appeal of Mastermind remains trying to crack the code as a single individual. If you switch off the somewhat annoying music, you can easily find hours passing Tetris-style as you try just one more time to guess the secret combination.

The big question, though, is whether you want to pay for a full commercial version when there are numerous freeware and Java versions available online. Hasbro's implementation looks groovier and includes new playing options, but you'd probably want to be a real Mastermind fanatic to shell out your hard-earned cash for this.

Angus Kidman

Distributor	Wolf Interactive
Phone	(02) 9417 9600
Online	http://www.hasbro.com/
Price	$49.95
Requires	Pentium, 8M RAM, 4x CD-ROM drive, 13M hard disk space
Classification	G
Rating	★★☆

Games News

● The release of the original Carmageddon game sparked a media frenzy about violence in computer games the likes of which have never been seen in Australia before. And yes, it's all set to happen again, because Carmageddon 2: Carpocalypse Now is on its way to our shores, and it's even more explicit, more amoral, more gratuitous, and more violent than the original. Local gaming industry insiders have been looking at beta and demo versions of the game and the consensus is that it will be refused classification unless some changes are made. The big no-no is realistic violence directed against humans. This was circumvented last time by forcing Australian players to use Zombie mode in Carmageddon, which essentially just gave the pedestrians green blood. It is likely that a similar customisation will be necessary in Carmageddon 2. Don't let the furore divert your attention away from the actual game, which is surprisingly quite good — once you discount the unnecessary and silly pedestrian violence.

● A number of very patient gamers were left feeling very frustrated with Origin a short while ago. The source of the frustration is the release of the next Wing Commander game, Secret Ops, which was available for download from the Internet. Origin has decided to release the game free, and will be offering new missions on a weekly basis from its Web site, http://www.secretops.com/. Before you can play the missions, however, you need to download the game engine — a hefty 120M. Most people wouldn't bother downloading a file that large, and to top it off those who did discovered it was infected with a virus!

● The days when your average game development company was a couple of friends working in a garage in their spare time are long gone. Electronic Arts, for example, one of the largest game companies in the world, has just become even bigger by buying Westwood Studios (the creator of Command & Conquer, Red Alert, and Blade Runner) for about $US122 million. There was also a rumour circulating that Electronic Arts is interested in Sierra On-Line and Blizzard Entertainment, put up for sale by parent company Cendant Software (formerly CUC Software). The asking price is between $US1 billion and $US1.5 billion.

Gamespy

Constitutions, post-mortems, inquiries and history catalogued online.

Archive it

Archives of Australia

Archives of Australia is part of Australia's Cultural Network, which can be thought of as a Web ring linking together a multitude of Australian cultural resources. Archives of Australia is intended to encourage the many archives in Australia to take advantage of the opportunities made available by the Web. This is an admirable goal, but whether it is achieved is questionable.

Government sites really need to have two key criteria if they're going to be declared a success — they need to be fast loading and easy to navigate. It also helps if the documentation is easy to understand, and if there are a couple of alternative versions available — a community language or two, a text-based version of the site and so on.

ArchiveNet makes the mistake of using one of those annoying entrance pages where a picture needs to be loaded, usually with a 'click here' attached, before you get to the real main page of the site. What makes Archives of Australia's use of this preliminary page even worse is the time it takes to load over a 33.6K connection. It took four attempts at various times

throughout the day before our test configuration — an iMac using IE4 connected by an internal V.90 modem to the Internet via an OzEmail dial-up account — managed to load the page late in the evening. Comparisons using a Windows 98 machine connected to the Net via *APC*'s 256K DDS Fastway connection showed that the problem is at the server end — it took two attempts during the middle of the day before the page loaded.

Navigating through the site is comparatively easy once the page has loaded, but a text-based version would be preferable. The target audience, presumably individuals trying to locate a starting place for their research, are going to be far more interested in speed than in fancy mouseovers and twee bits of trivia.

Documentation on the site isn't very clearly written, and there is no simple outline of how to go about finding certain information. The upshot of the entire site seems to be that archival information probably isn't going to be online, but it really doesn't hurt to have a look.

On a more positive note, the links are comprehensive, especially to international sites. Overall, ArchiveNet is moderately useful, but for it to become a really useful starting place for archival searches, its purpose needs to be made completely obvious.

Josh Gliddon

■ **Online** http://www.archivenet.gov.au/
■ **Rating** ★

National Archives and Records Administration

If you've ever felt the urge to expand your knowledge of US policy by reading the Constitution of the United States, you can at http://www.nara.gov/. NARA is an independent federal agency that oversees the management of all US federal records.

NARA archivist John Carlin says: "Our mission is to ensure ready access to the essential evidence that documents the rights of American citizens, the actions of federal officials, and the national experience." The site is based on the idea that putting documents online allows anyone to access them from anywhere.

On NARA's Web site you'll find the cornerstone documents of the US government, the Charters of Freedom — the Declaration of Independence, the constitution and the Bill of Rights — as well as many of NARA's current and past exhibits.

The guts of the site is at the Exhibit Hall, where most of the documents will be found. There are some interesting exhibits, including poster art from World War II and the JFK assassination records. If you've ever wondered what the autopsy report on Abraham Lincoln found, who was on the

Hindenberg when it exploded, or what the air force discovered about UFOs, the answers can be found on NARA's site. Considering the nature of the material, it's a shame not all of the exhibits are online in their entirety, but NARA says it aims to post as much as possible over time.

The site provides information for those intending to visit NARA, virtually or physically. There is no substitute for an actual visit, but an online visit allows documents to be studied in greater detail, and is, of course, much more practical for Australians. Online visitors can examine the Letter of Transmittal and pages two and three of the constitution, which are rarely displayed.

The Digital Classroom is aimed at school teachers and curious students; it contains historic documents, lesson plans and activities. It is a comprehensive section which encourages teachers to use primary documents when teaching students about important US historical events, such as Watergate, women's suffrage and the *Amistad* case. There is a quiz for trivia buffs on US presidential inaugurations.

The site links through to The Herbert Hoover Presidential Library and Museum which also has some good activities for teachers and students (http://hoover.nara.gov/).

The NARA site's design is functional, if a little pedestrian, but the emphasis is on content and there's no shortage of information. All the pages are heavily hyperlinked and it's easy to get absorbed for hours browsing the exhibitions and articles.

Claire Waddell

■ **Online** http://www.nara.gov/
■ **Rating** ★★★★

Public Records Office

The Brits have some really juicy stuff in their archives and the 1990s have seen the release of many top-secret WWII files connected with secret operations, spy networks and the like.

Unfortunately, you'll find none of this online. The Public Records Office (PRO) runs an informative site for those wishing to visit its physical location (how to get a reader's ticket, where to find accommodation nearby, hints for finding documents); but it offers only a few excerpts from the vast number of volumes stacked on its 150km of shelving.

Instead, the PRO's site drops tantalising mentions of records beginning with the Domesday Book of 1086 and continuing through Elizabeth I's jewellery list, Shakespeare's will, Guy Fawkes' confession, Bligh's account of the Bounty mutiny, Napoleon's post-mortem, the British Ambassador's despatches from the Russian revolution, Edward VIII's abdication, minutes of Churchill's war cabinet and the 'Dambuster' squadrons' debriefings. Spend too long at this site and you'll be buying a ticket to London — if the teasers don't encourage you to make the trip, the slow speeds will. On a day when other overseas sites downloaded fairly quickly, the PRO's images took a long while to appear.

As a source of visitor information and a public relations exercise, this is a worthy site. It provides exactly what the visitor needs to know, in a neat, easily navigable format. There's even a useful list of other European archive sites, along with commentary. But it's not a research tool and will not become one for another three years, when the organisation intends to complete its 'Archives Direct 2001 Programme' (AD2001).

AD2001 should bring a searchable electronic catalogue online, with secure document ordering and "a virtual museum with access to digitised images of some of our records". In the end it all comes down to money — the PRO charges for many of its services, and there's a risk in offering too many things to the world for free.

Some of the groundwork for AD2001 is available on the PRO site under the obscurely named 'Core Executive Pilot'. If you're researching British history connected with the Prime Minister's Office or a government economic body, you may find something helpful in this database. Separately, 100 information leaflets covering various topics have been placed online as an aid to finding certain PRO records (check the Finding Aids icon).

The PRO also produces books consisting of compiled information on a topic. The Web site was due to have a secure ordering server set up by the end of September. Sample pricing includes *Operation Foxley: The British plan to kill Hitler* for £9.99 and *Titanic: The official enquiry* for £75.

Simon Vandore

■ **Online** http://www.pro.gov.uk/
■ **Rating** ★★★

Surfbaud: Cataloguing knowledge

The Web could be considered the greatest library that ever existed, except that it lacks a cataloguing system to make information easy to find. Part of the problem lies with HTML, the current lingua franca of the Internet, and the other part lies with using URLs as an addressing scheme. Still, things could be worse — imagine having to remember 203.18.241.20 every time you wanted to visit **apcmag.com**!

HTML is a subset of Standard Generalised Markup Language (SGML), a particularly impressive metalanguage that allows organisations to develop specialised languages with which they can present specialised information. SGML is important because it separates the structure of documents from the information that the document contains. The upshot of this is that groups such as mathematicians can have a language that presents their data in a way that's readable to both machines and humans. The machines can understand the structural part, which includes, for example, tags delineating certain pieces of information as a 'formula', and humans have the formulae presented in a consistent and readable manner.

HTML is SGML's inbred cousin. It tells a browser that information should be presented in a certain way, but it doesn't have a specific schema for tagging and identifying types of information. Put another way, HTML mixes the structural information with the data described by that structure.

This is why search engines are such terrible tools. They trawl the Web cataloguing words so that when you type in a simple Boolean search, such as 'goldfish' + 'caring', you can retrieve information about caring for goldfish. But what about the site devoted to the rock group Goldfish and their record *Caring for*? Or the porn site that has 'goldfish' listed in its meta tag? Or a book of Japanese haiku, the title of which translates as *The simple art of caring for goldfish*? The information presented by HTML about a document gives no clue as to the contents of the page, resulting in the garbage spewed forth by most search engines.

Physical libraries solved this problem a long time ago when it was realised that arranging information in terms of keywords — an alphabetical arrangement by title or author, for example — would only work for so long. The funkily named Melvil Dewey invented the Dewey Decimal Classification system which divides all knowledge into 10 primary classes. These 10 classes are subdivided into 10 divisions, and these divisions are in turn divided into 10 sections. Despite the inroads made by the US Library of Congress classification system, Dewey remains the most commonly used knowledge classification system on the earth.

There have been attempts to use Dewey classification on the Net, but there's no real incentive for people to apply a common classification schema.

Which brings us back to the original problem — the likelihood of finding *anything* online quickly and easily is very low. XML, a simplified version of SGML, which will allow information classification, will go some way towards solving this problem. But it won't happen anytime soon, so until then the Net is not going to challenge a conventional library as a solid research tool.

Links: CyberStacks is a collection of online resources categorised using the Library of Congress classification scheme, located at http://www.public.iastate.edu/~CYBERSTACKS/. An expanded introduction to the Dewey Decimal Classification system is at http://www.oclc.org/oclc/fp/about/expand.htm.

CyberDewey is a guide to Internet resources organised using Dewey Decimal Classification codes, at http://ivory.lm.com/~mundie/DDHC/DDH.html.

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Even Pentium motherboards are not immune to the Year 2000 bug! - so don't leave it 'till it's too late. The Year 2000 BIOS Card solves the problem of progression from 1999 to 2000 as well as 21st century leap years. It is an 8-bit card which provides year 2000 support for motherboards with a BIOS which only stores the year with two digits. i.e. 97 instead of 1997.

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Chip Chat

Codenames

Since time immemorial, software and hardware developers have endowed their products with stupid codenames such as Memphis, Chicago, Warp, Braised Salmon, and so on. Clearly, the available base of codenames is rapidly being depleted, because some recent suggestions have raised the moron bar even higher.

According to well-placed sources, the next round of Apple PowerBooks was initially codenamed Lombard, but was changed at a late stage to the codename '101'. Of course, as any student of acronymy knows, LOMBARD stands for Loads Of Money But A Real Dickhead. Any resemblance to Steve Jobs is believed to be entirely coincidental.

However, it has to be said that '101' — as in entry-level course at a US college — isn't much of a choice. Can we look forward to products codenamed '666', '69', '8675309' and '99 Luftballons'?

Smut and all that

Anyone who went online any time in the past three months could be forgiven for thinking that the Starr report, detailing a variety of alleged sexual misalliances by President Clinton, was the first official document ever to be published on the Web in the history of the universe. The report ended up with more mirror sites than Tucows, but ultimately proved to be far less useful.

Even more amusing was the fact that so many US news publications ran advisory pieces on how parents should cope with the possibility that their kids might accidentally read some of the seamier details of the report online, while conveniently neglecting to mention that finding explicit descriptions of sexual activity online is not actually difficult. That problem was amusingly highlighted by well-known pornocrat and *Hustler* publisher Larry Flynt. In a letter to Starr, Flynt wrote: "After a reading of the Starr report I am impressed by the salacious and voyeuristic nature of your work," Flynt wrote to Starr on Wednesday, offering him a job with his group that publishes magazines specialising in sexual subjects. "The quality and quantity of material you have assembled in the Starr report contains more pornographic references than those provided by the Hustler Online services this month." Somehow, we doubt this, but we decided that it would be better not to try and find out by doing any detailed research on the Hustler site. Ahem.

Dating tips

Everyone's heard of the millennium bug, but did you realise that for Microsoft it's already happened twice? An alert reader pointed out to us that if you go to the conveniently named page http://www.microsoft.com/windowsnt5/server/default.asp?site=nts5 and scroll to the bottom of the page, you'll see an announcement of the main features of Windows NT Workstation 5.0 dated December 30, 1899. Now we've heard of long development cycles, but this is just silly.

There are a number of possible explanations for this problem:

(1) Microsoft's development staff had a lapse.
(2) Microsoft's PR staff had a lapse.
(3) Microsoft's Web server software had a lapse.
(4) Bill Gates is much older than we previously thought.
(5) Bill Gates has used his limitless wealth to develop time travel, and is now looking to change the past as well as the future.
(6) Someone at Microsoft was desperate to get the company covered in Chip Chat.

We'll leave you to choose — they all sound good to us.

Search engines and all that

Dumb search engine tip of the month: Searching for the words 'cigar', 'Bill' and 'depraved' in AltaVista results in an only-to-be-expected 364 hits. Searching for the words 'cigar', 'Bill Gates' and 'depraved' results in a slightly more unusual 25-odd hits. What does this mean? Nothing, probably, but we thought you'd like to know.■

Contest: Technology gag of the month

The technology gags continue to flow in thick and fast (sounds a bit like the writers at Chip Chat, really). A handy hint for any of you who are keen to win the monthly prize: you've got a better chance if you send in a single, totally corking joke, rather than bombarding us with everything you managed to find online on a wet and rainy Sunday. This month's winner comes from Simon Parker, and is so bad it's truly brilliant:

Q: What sits on a pirate's shoulder and says "Pieces of seven, pieces of seven!"?

A: A parity error.

We'll be sending Simon a tasteful leather-bound desk pad, courtesy of Maxtor. Send your jokes — the shorter and funnier the better — to chipchat@acp.com.au. If we publish your joke, you'll win a stunning but somewhat random prize.

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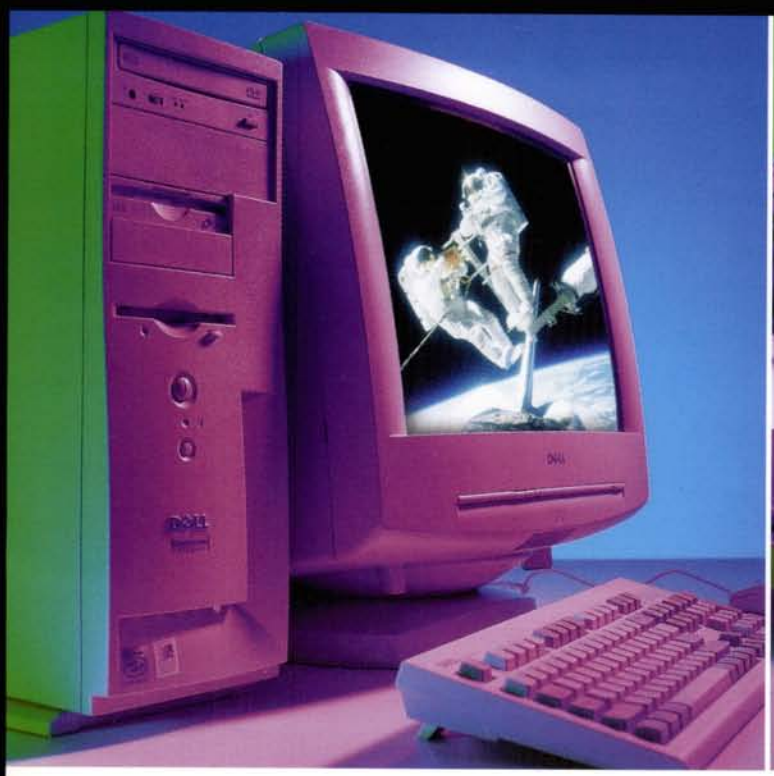

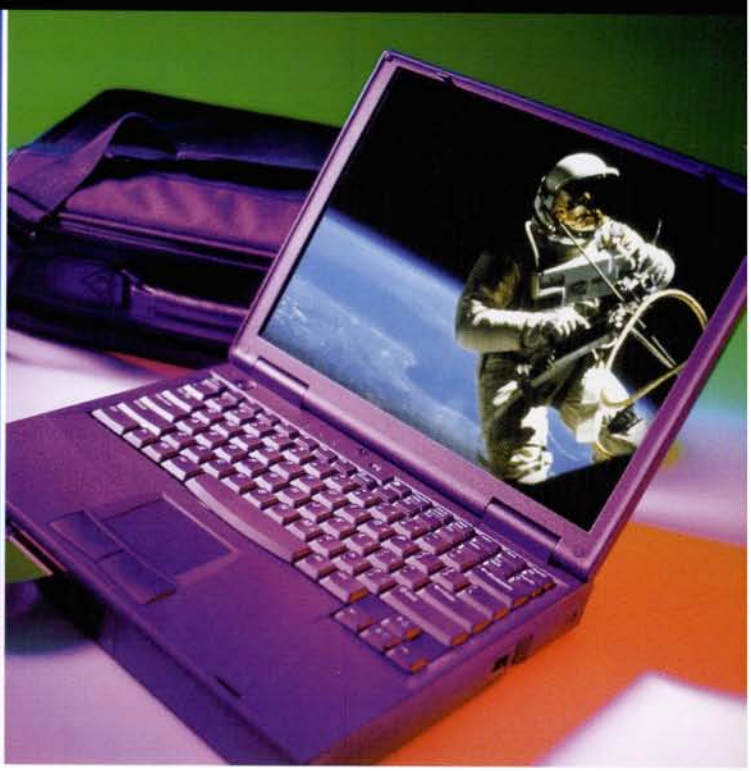

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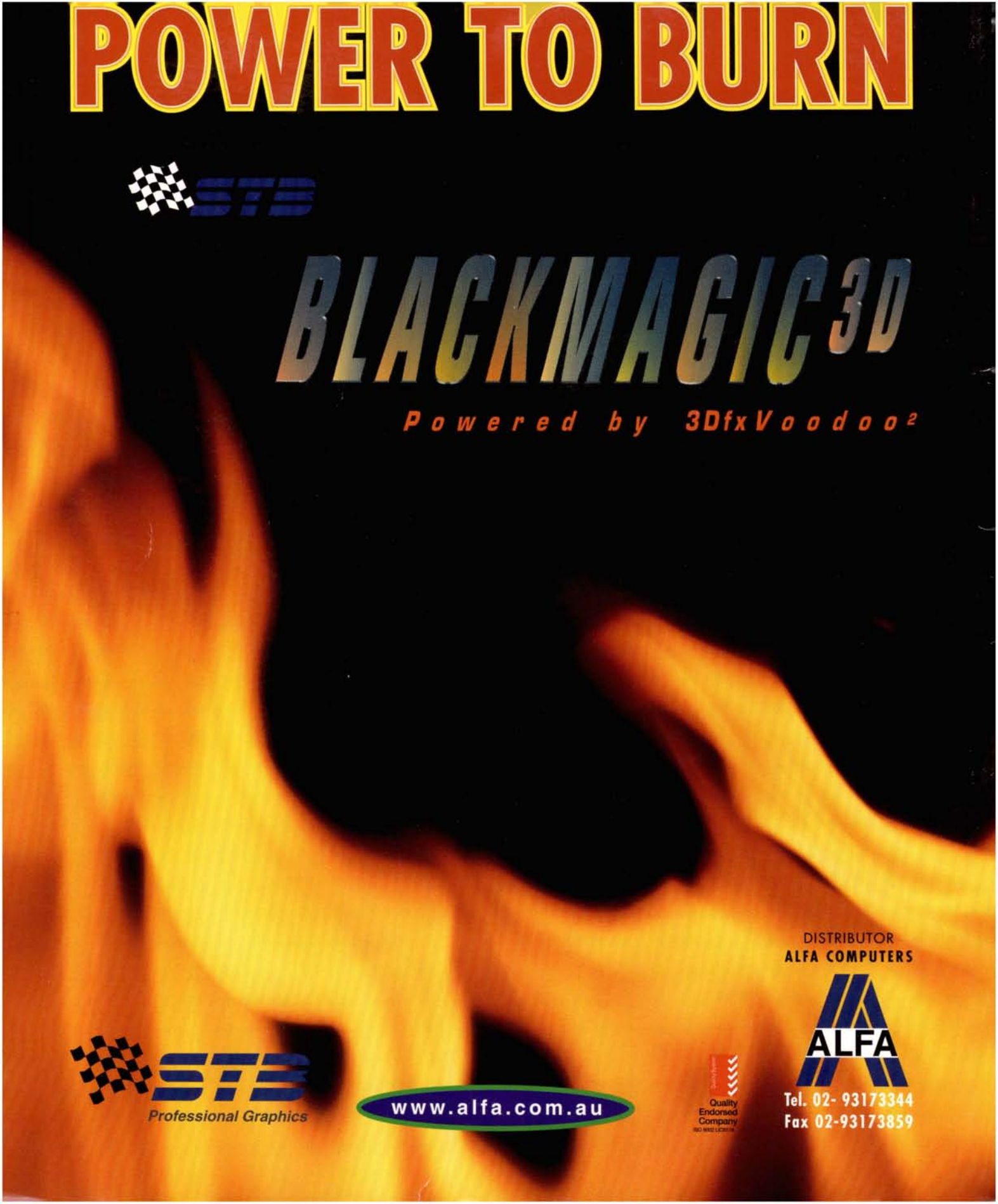
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